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PRODUCTION • FABRICATION • TREATMENT • APPLICATION

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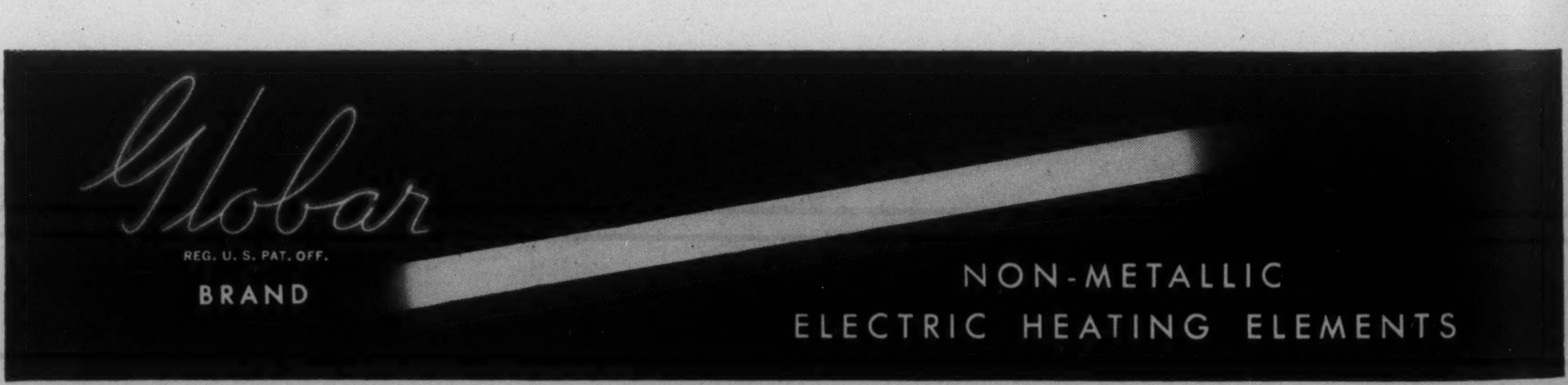

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Highlights

WRITTEN BY THE ABSTRACT SECTION EDITORS AND THE EDITORIAL STAFF

Do you want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Silver for Brazing

Silver solders are displacing the older brazing brasses, according to Bennett (page MA 422L2). Ag lowers the melting point and insures free-flowing, strong, ductile alloys of better corrosion resistance.—E.F.C.

Building Up Machine Parts

The "Fescol" process for building up worn or undersized metal parts, particularly steel, by nickel plating, is described and discussed by Geiger (page MA 427R7). Hardness may be varied up to 60 scleroscope. Wear resistance is reported high. —E.F.C.

Bright Nickel Plating

Obtaining bright nickel plated deposits is a live subject. Its foreign aspects are reviewed by Springer (page MA 430R3) and the conditions essential to the production of such deposits are discussed. Bright Ni plating baths of recent development usually contain complex aromatic sulphonic acids.—E.F.C.

Save the Surface

Haigh's discussion (page MA 427R10) of failure of wire rope by fatigue, stressing the importance of avoidance of a weak, decarburized surface is quite in line with behavior of springs. Controlled atmospheres for heating high carbon steels by which decarburization may be avoided are badly needed.—H.W.G.

Reinforced Tooth-fillings

Page the silver producers. Reinforcing bars for amalgam fillings are made from silver alloys (page MA 443L7). We suppose re-rolling of thin dimes for this purpose would be against the law. Why not add carborundum or tungsten carbide and make them approximate grinding wheels or tools while we're at it?—H.W.G.

Cherchez la Pointe Curie

Kussman and Schulze (page MA 431L6) suggest that in locating the Curie point the use of the temperature vs. electrical resistance curve be abandoned in favor of the temperature vs. (low density) magnetization curve.—F.P.P.

Fatigue Agreement

Pomp and Hempel's (page MA 430R8) fatigue test results for screws gives stress concentration factors in good agreement with those of Moore and Henwood for different size threads, according to our section editor.—F.P.P.

Age-hardening

Marie Gayler (page MA 433R4) presents an exhaustive analysis of age-hardening phenomena and offers a new theory that postulates two distinct steps (diffusion and precipitation) in the process.—F.P.P.

Thermal and Electrical Conductivities

Always useful are accurately determined and applicable factors for converting electrical conductivity to thermal conductivity, as determination of the latter directly is an extremely difficult operation. Kempf and Smith (page MA 435L6) have established the Wiedemann-Franz-Lorenz ratio for Al-base alloys of commercial importance between 0° and 400° and have applied their factor in the calculation of the thermal conductivities of a total of 42 Al alloys.—F.P.P.

Die Castings

Die castings of brass are as strong as annealed mild steel, according to Fox (page MA 411L3). Other advantages are discussed.—E.F.C.

Steel Made With No Mn Additions

Wilhelm (page MA 411L6) describes the production in Germany of steel without Mn additions, the product containing only 0.20% Mn. No hot shortness. Steel and plate rolled from this not much different from ordinary steel of this grade.—E.F.C.

Dental Metallurgy

If your *Buccal Mucosa* (whatever that is) is misbehaving, Roome's article (page MA 442R7) may provide enlightenment, tho' probably no relief. Just another example of our unique versatility.—F.P.P.

Flakes

Some theories on flakes in steel are offered by Krutitski and Maslanski (page MA 412R1). Data indicate a connection between flake formation and cooling speed. Susceptibility of a metal to flake formation depends on melting practice. Cooling slower than 15° C. per hr. in the interval between 400 and 150° C. prevents flakes in almost all steels.—E.F.C.

Oxygen in Steel

Another report from the Bureau of Standards on its Comparative Study of Methods for the Determination of Oxygen in Steel (page MA 437L1) has appeared. This is a beautiful example of cooperative activity (34 laboratories are helping) and should be continued.—F.P.P.

Accelerated Corrosion Tests

We wonder if the potentiometric method of predicting the corrodibility of metals described by Guitton (page MA 439L5) will be any more useful than previously developed accelerated corrosion tests, most of which have been found unsafe for service forecasting.—F.P.P.

Corrosion-resistant Symposium

An excellent A.S.M.E. symposium on the use of corrosion resistant alloys in the design of machinery and equipment appears in *Mechanical Engineering*. (page MA 440R8). It is one of those thorough-going compilations that are usually added to the reader's personal file, marked "important." —F.P.P.

Newark's Water Mains

While Bank's description (page MA 442R2) of the reconditioning of 50 miles of Newark, N. J., riveted steel pipe lines sounds interesting, we personally would prefer a story on the rehabilitation of the city's boilers—Newark's water is among the hardest in the country.—F.P.P.

Dephosphorization in Induction Furnaces

According to Siegel (page MA 411L8) dephosphorization of steels in German induction melting furnaces is obtained by adding sodium carbonate to slags high in lime and FeO. More fluid slags were noted.—E.F.C.

Designers and Heat Treatment

Close cooperation between metallurgists and designers is urged and discussed by Hubbard (page MA 414R2) and some practical examples are cited. Machine designers in general should be informed as to certain metallurgical aspects.—E.F.C.

Chromium gives longer life to High-Manganese Steel Castings

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Miscellaneous Chromium Alloys

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Calcium-Aluminum-Silicon
Calcium-Manganese-Silicon

• • •

ZIRCONIUM
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MANGANESE
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EDITORIAL

Want to Know!

We get some amusement from scanning abstracts or titles of papers presented to learned societies in fields other than metallurgy, for the light they throw on what different brands of scientists think important enough to study. We are handicapped in our appreciation of these topics because we are so built that we naturally feel that the information sought ought to be of some use to somebody and not merely acquired in order to satisfy purely intellectual curiosity. The physicists' topics often seem weird and wonderful to one with such a point of view. We are a bit more lenient toward the research studies of the medical profession for we feel that the doctors are feeling their way with the definite aim of remedying human ills, even though we often fail to see the direct connection.

We ran across one medical title the other day that interested us, "Distribution of the Taste-Buds on the Kitten Tongue at Birth." We doubt if the catnip growers are fostering the investigation and we are a bit curious as to just what the information is supposed to lead to.

But many of the topics of scientific metallurgy would seem quite as far fetched to workers in other fields, and often to the practical metallurgist.

In METALS AND ALLOYS itself, the editorial staff has often to deal gently but firmly with the publication and advertising staff on the point of allotting suitable space to so-called "high-brow" articles. We grant that quite a proportion of our readers don't care a hoot about the specific details of some such articles and will not take the time to try to follow them. Nevertheless, every such reader rejoices, at least when he stops to think, that there are those who are trying to clear up knotty points of what at the moment may seem like mere theory. They recognize that lots of this sort of work never does get anywhere, but some of it does in the long run, and it is not possible to say with certainty today which article merely starts into a blind alley and which into a future main thoroughfare. Hence, they are glad that metallurgy, along with other sciences, has those who are imbued with the old Yankee spirit of "I want to know!"

It is a bit exasperating to think of the hours of patient toil and the pages of articles necessary before a new fact becomes so well known and so clearly understood and expressed that it can be boiled down to a sentence in a handbook or text book, accepted and utilized by everyone with the sub-conscious feeling "Of course, we always knew that." But many of the "well known" facts of today were but hazily glimpsed and feebly stated in the technical literature of a decade or so ago. Without doubt, many another useful fact is still wrapped in the chrysalis of highbrow articles from which it will later emerge, scarcely recognizable as having once been in its present form.—H. W. G.

Snake Oil

It seems a matter for some degree of pride that while politicians and union racketeers are thriving by working on the assumption that most of the public is either moronic and can't think, being swayed by emotion only, or too laxy to think or act, being willing to let the loudest mouthed demagogue lead them, they don't care where, yet the metallurgical industries find it necessary to operate on the basis that the technical people in their own industries and in those to which they sell are neither moronic nor gullible. This is not astonishing, for among technical folk, New Dealers and C.I.O. sympathizers are conspicuous by their absence. The published article, the advertisement, or the metallurgical salesman that takes the attitude of the vendor of cosmetics, cigarettes, or snake oil is almost extinct.

The political administration may be able to get away with the "papa knows best" attitude for the time being, as the dictators of other lands that they ape are doing. But those days are gone from technical fields even though, by and large, it's a moronic world.—H. W. G.

Losses in Processing Stainless Steels

It is generally recognized that one cause of the high cost of rolled products of stainless steels is the waste in reduction from the ingot to the finished product. Some very satisfactory proof of this fact is afforded by an analysis of the production data of the American Iron and Steel Institute on other pages.

These statistics show that the percentage of finished steel products of the total tonnage of ingots of stainless steel is as follows for the last three years:

	Ingots	Rolled Products	Per Cent
1934	49,917	34,079	68.3
1935	65,697	41,799	63.6
1936	90,966	61,365	67.5

The average percentage of finished steel products of the total ingots produced for the last three years is 66.4 per cent. This is by no means a high yield and this condition, supplemented by expensive raw materials and finishing equipment, contributes to the sustained high cost of rolled stainless steel products. Despite this, however, the demand continues to expand.—E. F. C.

It Goes Round and Round

An interesting example of arguing from the specific to the general and repeating the generalities as truth occurs in the history of chromium-molybdenum carburizing steels.

Carburizing experts worked with such steel in '22, '25, and '28 and turned thumbs down on them because of narrow temperature limits in carburizing, lack of core tough-

(Continued on page 190)

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CURRENT Metallurgical Abstracts

A DIGEST OF THE IMPORTANT METALLURGICAL DEVELOPMENTS OF THE WORLD

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CLASSIFICATIONS

1. ORE CONCENTRATION

Crushing, Grinding & Plant Handling (1a), Gravity Concentration (1b), Flotation (1c), Magnetic Separation (1d), Amalgamation, Cyanidation & Leaching (1e).

2. ORE REDUCTION

Non-Ferrous (2a), Ferrous (2b).

3. MELTING, REFINING AND CASTING

Non-Ferrous (3a,) Ferrous (3b).

4. WORKING

Rolling (4a), Forging & Extruding (4b), Cold Working, including Shearing, Punching Drawing & Stamping (4c), Machining (4d).

5. HEAT TREATMENT

Annealing (5a), Hardening, Quenching & Drawing (5b), Aging (5c), Malleableizing (5d), Carburizing (5e), Nitriding (5f).

6. FURNACES, REFRACTORIES AND FUELS

7. JOINING

Soldering & Brazing (7a), Welding & Cutting (7b), Riveting (7c).

8. FINISHING

Pickling (8a), Cleaning, including Sand Blasting (8b), Polishing & Grinding (8c), Electroplating (8d), Metallic Coatings other than Electroplating (8e), Non-Metallic Coatings (8f).

9. TESTING

Inspection & Defects, including X-Ray Inspection (9a), Physical & Mechanical Testing (9b), Fatigue Testing (9c), Magnetic Testing (9d), Spectrography (9e).

10. METALLOGRAPHY

11. PROPERTIES OF METALS AND ALLOYS

Non-Ferrous (11a), Ferrous (11b).

12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

13. CORROSION AND WEAR

14. APPLICATION OF METALS AND ALLOYS

Non-Ferrous (14a), Ferrous (14b).

15. GENERAL

Economic (15a), Historical (15b).

1. ORE CONCENTRATION

JOHN ATTWOOD, SECTION EDITOR

Progress Reports—Metallurgical Division. 16. Ore-testing Studies. Introduction. C. W. Davis. *U. S. Bur. Mines Rep., Investigations* No. 3328, Feb. 1937, pp. 3-4. **Ore-dressing Tests and Their Significance.** W. F. Dietrich, A. L. Engel & Morris Guggenheim. *Ibid.*, pp. 5-35. Preliminary investigations, consisting of the following, are described: Crushing, sampling, sizing, float- and sink-testing, microscopic study, magnetic tests, heat treatment, agglomeration, and explosive shattering. The equipment and procedure for gravity-concentration and magnetic-concentration tests are described. Flotation testing is discussed in great detail including dry versus wet grinding, flint versus steel balls, water supply, pulp density, soluble salts and colloids, continuous versus batch grinding, correlation of gravity or magnetic tests with flotation tests, selection of reagents, quantities of reagents and manner of introduction, open-circuit batch tests, closed-circuit batch tests, closed-circuit continuous tests, grinding equipment and procedure, flotation equipment and procedure, and factors influencing the choice of flotation testing methods. **Reports of Tests.** C. W. Davis & Staff of the Ore Dressing Section. *Ibid.*, pp. 51-150. Results of tests on 1 Sb, 1 Cr, 1 fluorspar, 7 Au, 5 Au-Ag, 1 Au-Ag-barite, 1 Au-Ag-Cu, 1 Au-W, 2 Li, 1 Mo-Pb, 1 Ag-Pb, 2 Ti, 1 W slime, 1 V, 1 Zn, and 1 Zn-Pb ores are reported with recommendations as to treatment to be used. AHE (1)

Present Tendencies in Iron Ore Preparation. A. J. Gleason (Pickands, Mather & Co.) *Mining Congr. J.*, Vol. 23, Jan. 1937, pp. 60-63. Crushing to max. 3 to 8 in. size is the most widely used preparatory method. Some washing plants crush to ¾ to 2 in. max. size. Sandy ore is washed to remove sandy fines; a small quantity of ore is also jigged to remove coarse gangue. Ore of high moisture content is sometimes roasted to eliminate water and to improve smelting properties. Many furnace operators are of the opinion that the demand for better steel may force Fe ore producers to crush their ores to some limiting size; which size will depend on the way the ore reduces in the furnace, and then screen out the fine ore to be agglomerated, so that no fine material will enter the furnace and cause channeling and excessive flue dust. Sampling and screening are discussed, and data are given on porosity and decrepitation tests, to indicate the factors that will have to be considered if such a program is undertaken. BHS (1)

Gold Ore from Duparquet Mining Company, Limited, Duparquet, Quebec. W. B. Timm *et al. Can. Dept. Mines, Mines Branch,* Rept. No. 763, 1936, pp. 6-10. Cyanidation of an ore assaying Au 0.31 and Ag 0.05 oz./ton and As 0.75% at —200 mesh gave 61% extraction. Flotation at 77% —200 mesh resulted in 90% recovery and at 96% —200 mesh, 94%. **Gold Ore from the Canadian Reserve Mine, Larder Lake, Ontario.** *Ibid.*, pp. 23-50. Flotation gives 98% Au recovery in a 2 oz. concentrate. Cyanidation of the concentrate at —325 mesh extracts 85-90% of the Au. **Gold Ore from the Miller Independence Mine, Boston Creek, Ontario.** *Ibid.*, pp. 63-70. Cyanidation of ore assaying Au 0.955 and Ag 0.14 oz./ton followed by flotation of the tailing and cyanidation of the reground concentrate gave 87.8% recovery. Removal of coarse Au by blankets prior to initial cyanidation, followed by flotation and cyanidation of both blanket and flotation concentrate resulted in 96.9% recovery. **Gold Ore from the Vimy Gold Mines, Limited, Ramore, Ontario.** *Ibid.*, pp. 71-80. Cyanidation recovers 91% of the Au in this ore. Concentration of sulfides, followed by retreatment, raises this to 95%. For a small operation, flotation will recover approximately 90% in a concentrate assaying 2.5-3.5 oz. Au. **Copper-gold Ore from the Manitoba and Eastern Mines, Limited, Timagami, Ontario.** *Ibid.*, pp. 87-89. Cu must be removed from this ore (Au 0.34 and Ag 1.49 oz./ton, Cu 0.78, As 3.45, Pb 0.07, Zn 0.15, and Co. 0.02%) by flotation before the Au can be recovered by cyanidation. **Gold-silver Ore from the Chapleau Mine of the Reward Mining Co., Limited, Slocan City Mining Division, B. C.** *Ibid.*, pp. 97-102. Flotation followed by blanketing of the tailing will recover 90% of the Au and 85% of the Ag. **Gold Ore from the Wendigo Mine, near Kenora, Ontario.** *Ibid.*, pp. 103-116. The ore assays Au 0.23 and Ag 0.07 oz./ton and Cu 0.40%. A complicated flow sheet involving a combination of blanket concentration, flotation of tailing and cyanidation of flotation tailing gave 98% recovery, but with high cyanide and lime losses. Cyanidation of the blanket tailing gave 95% recovery and the flow sheet is simpler. AHE (1)

Sintering of Oxidized Lead Ores and Concentrates at the Chikment Plant (Russia). N. A. Gosteev. *Tsvetnye Metall.*, No. 8, Sept. 1935, pp. 76-101. A lengthy description of sintering operations and suggestions for improvements. BND (1)

1c. Flotation

A Study of the Flotative Properties of Hematite. W. E. Keck, G. C. Eggleston & W. W. Lowry (Mich. College Mining & Tech.) *Mining Tech.*, Vol. 1, Feb. 1937, T.P. 736, 24 pp. Original research. Relatively pure samples of massive and specular hematite were studied in a small flotation machine. As collectors, oleic acid and Na oleate were superior to several other fatty acids and soaps. Spongy and solid massive hematites were about equally floatable. Usual frothers greatly increased flotation. Increasing acidity or alkalinity first activated and then completely depressed massive hematite. Some metal salts increased flotation while others entirely prevented it. Na metaphosphate were powerful activators with unsaturated collectors and had little effect or were depressors with saturated. Na silicate, gelatine, and tannic acid were strong depressors for massive mineral. Specular hematite was slightly more floatable than massive hematite. 9 references. JLG (1c)

Tests on the Flotation of a Transvaal Refractory Gold Ore. L. P. Durham & J. E. Laschinger. *J. Chem. Met. Mining Soc. S. Africa,* Vol. 37, Nov. 1936, pp. 196-204. A refractory Au ore, a foliated chloritic grit containing pyrite and arsenopyrite, owing its refractoriness to encasement, its clayey nature, to the content of As (0.03%) and of oxidized Fe compounds, and possibly to tarnished Au, was floated to give a concentrate assaying 75-90 dwt. Au/ton at 94% or more recovery using butyl xanthate, amyl xanthate and pine oil in an alkaline pulp. The concentrate consisted mostly of pyrite and arsenopyrite. AHE (1c)

Flotation of Pyrite. H. W. Gartrell. *Chem. Eng. Mining Rev.*, Vol. 29, Jan. 8, 1937, pp. 141-144. An up-to-date review of mineral flotation. To make the pyrite float less readily, cyanide and/or lime are employed. Potassium ethyl sulphate is used to film the pyrite, and to remove existing alteration products preparatory to the filming. In mills floating only pyrite or pyrite plus Au (no CN being used), $CuSO_4$ may be used. For Au ores intimately associated with pyrite, a small amount of $CuSO_4$ increases recovery. The effect of conditioning reagents may vary greatly with different specimens of the same mineral. The effect of $CuSO_4$ on the nature of the froth is more evident in plant than in laboratory results. In a strongly alkaline pulp almost all the Cu is promptly precipitated and the rate of reaction with the sulfide surface or with the CN ion depends on the amount of Cu ion available, as well as on the solubility of the replaced metal. WHB (1c)

1e. Amalgamation, Cyanidation & Leaching

Treatment of Low Grade Gold-tin Concentrate. G. B. O'Malley. *Chem. Eng. Mining Rev.*, Vol. 29, Feb. 8, 1937, pp. 186-188. A description of Au recovery and the Sn concentrate plant at Cocks Eldorado. A low grade concentrate is taken from the dredge and the dressing process completed ashore. A flow-sheet is shown. The Au is extracted by amalgamation and the residue tabled, the table concentrate is treated on a magnetic separator and the non-magnetic product is despatched as the final concentrate. WHB (1e)

Report on the Effect of Lead Salts and Alkalis in Cyanidation. A. B. Beck & H. W. Gartrell. *Proc. Australian Inst. Mining & Met.*, No. 100, Dec. 31, 1935, pp. 499-509. Alkalis cause decreased cyanide extraction of Au from Bird-in-Hand table sands due to the presence of small amounts of oxidized Pb minerals. Tests show that 0.17% Pb as hydroxide with a very low alkalinity (0.005*N*) can almost completely stop solution of Au; $Ca(OH)_2$ has a greater effect than NaOH. Addition of H_2O_2 can counteract the effect of Pb hydroxide. Tetravalent Pb, and Bi, Hg(ic), and Sn(ous) hydroxides have no effect. It is postulated that the first stage in normal solution of Au by cyanide is formation of Na aurate in the presence of OH ions. This dissolves with formation of Na aurocyanide and H_2O_2. In the presence of Pb salts, the aurate is fixed as an insoluble Pb aurate which coats the Au and prevents further action by cyanide. AHE (1e)

Chromium in Cyanide Solutions. H. D. Bell. *J. Chem. Met. Mining Soc. S. Africa,* Vol. 37, July 1936, p. 17. A correction to article abstracted in *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 66L/9. AHE (1e)

2. ORE REDUCTION

A. H. EMERY, SECTION EDITOR

2a. Non-Ferrous

Copper Refining in Converters. T. W. CAVERS & G. M. LEE. *Trans. Can. Inst. Mining Met.*, Vol. 40, Jan. 1937, pp. 5-10; *Can. Mining Met. Bull.* No. 291. General. From Cu containing Cu 99.25%, Au 0.5 oz. and Ag 25 oz., Cu assaying as follows was obtained: Cu 99.86% (remelting and poling gave Cu 99.923%), Au 0.009 oz. and Ag 4.30 oz. Costs were less than 0.2 cents/lb. AHE (2a)

Filtration of White Mud at the Tikhvin Aluminum Plant. E. S. SHAPIRO. *Legkie Metal.*, Vol. 5, July 1936, pp. 18-20. In Russian. Substitution of decantation for filtration is recommended. HWR (2a)

Production of Aluminum Alloys in a Laboratory Blast Furnace. D. I. LISOVSKII. *Legkie Metal.*, Vol. 5, June 1936, pp. 53-63. In Russian. Bauxite, coke, and Na_2CO_3 were charged into a small furnace (900 mm. high) using O blast. The alloy obtained contained 78-92% Fe, 1.23-12.04% Si and 2.74-9.02% Al. Higher Al content could not be secured because it was impossible to produce a high enough temperature in such a small furnace. HWR (2a)

Reactions in the Al_2O_3-Fe_2O_3-SiO_2-Na_2CO_3 system. V. A. MAZEL. *Legkie Metal.*, Vol. 5, June 1936, pp. 42-52. In Russian. From mixtures of Al_2O_3, SiO_2, and Na_2CO_3 and of Al_2O_3, Fe_2O_3, SiO_2, and Na_2CO_3, $Na_2O.SiO_2$ and $Fe_2O_3.Na_2O$ were formed. At 800° C. $Na_2O.Al_2O_3$ is formed only when an excess of Na_2O is present. At 1200° C. $Na_2O.Al_2O_3$, $Na_2O.Fe_2O_3$, and $Na_2O.Al_2O_3.2\ SiO_2$ are formed. These form solid solutions which are insoluble in hot H_2O. HWR (2a)

The Thermal Dissociation of Nickel Sulphide. J. I. GERASIMOW, N. I. PIRZHALOV & V. V. STEPIN. *Zhur. Obshey Khim.*, Vol. 6, No. 11, 1936, pp. 1736-1743. In Russian. Original research. Dissociation pressure is constant during change of chemical composition of solid phase from NiS to $NiS_{1.37}$, but sharply increases in the range $NiS_{1.37}$ to $NiS_{1.44}$. The existence of the compound NiS_2 is suggested. NA (2a)

2b. Ferrous

Blowing-in Solid and Fluid Substances to Overcome Blast Furnace Scaffolding (Das Einblasen von festen und flüssigen Stoffen in das Hochofengestell) R. KRIEDE & J. ROLL. *Stahl und Eisen*, Vol. 56, Sept. 24, 1936, pages 1177-1179. Blowing-in ferrosilicon failed because of local temperature drop and slagging at tuyeres. Tar or petroleum were somewhat better. Blowing-in sand beneath the tuyeres helped correct variations in slag composition and was successful in avoiding scaffolding in an extended campaign. SE (2b)

Study of a Direct Method of Stainless Steel Production. R. P. FORSYTH. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Aug. 1936, pp. 94-95. Discussion. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 133R/9. AHE (2b)

Carbon in Pig Iron. WILLIAM E. BREWSTER. *Steel*, Vol. 98, Feb. 24, 1936, pp. 55-56. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 70R/8. MS (2b)

Sintering Plant Improves Blast Furnace Practice in South. M. F. MORGAN. *Steel*, Vol. 100, Feb. 8, 1937, pp. 60-61. Completion of Fe-ore sintering plant at Thomas, Ala., blast-furnace of Republic Steel Corp. has reduced fuel ratio and increased tonnage of Fe produced. Ore fines are mixed with an equal volume of blast furnace flue-dust and sintered. Furnace charge averages 70% crushed ore containing 32.30% Fe and 30% sinter containing 44% Fe. MS (2b)

"Scab" 8 Feet Thick Blasted Off Inner Lining While Furnace Is Operating. *Steel*, Vol. 100, Jan. 11, 1937, p. 21. Describes removal of fused deposit from inner lining of a blast-furnace by blasting with dynamite. MS (2b)

3. MELTING, REFINING AND CASTING

G. L. CRAIG, SECTION EDITOR

An Investigation of the Durability of Molding Sands. C. H. CASBERG & C. E. SCHUBERT. *Univ. Illinois Bull.* No. 34, Vol. 33, Apr. 21, 1936, pp. 1-52. Tests so far applied to determine durability of molding sands are reviewed and new experiments are described to outline a short and accurate method for determining the durability and to obtain the necessary amount of bond or sand required to bring a used sand back to its original strength. Green strength and permeability of natural and synthetic sands are shown in curves. A few formulas were derived to show the relation between base-exchange capacities of sand and bentonite, and bonding substance. The life of a molding sand cannot accurately be predicted. It is more economical for foundrymen to add clay or bonding substance to molding sands after using the sand for a number of heats than to try to hold the strength constant by frequent additions of bonding substance. The amount of bonding substance necessary to bring a given quantity of molding sand back to its original green compression strength depends entirely on the nature of the bonding material used. The durability of a molding sand depends on the physical and chemical properties of the minerals found in the bonding substance. 13 references. Ha (3)

Testing Molding Sand in America (État Actuel de la Question des Essais des Sables de Moulage en Amérique) WILLIAM G. REICHERT. *Bull. Association Tech. Fonderie*, Vol. 10, Aug. 1936, pp. 297-315. An extended abstract. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 67L/4. WHS (3)

Qualities of Pig Iron. Round Table. RALPH H. SWEETSER presiding. *Trans. Am. Inst. Mining Met. Engs.*, Vol. 120, 1936, pp. 155-170. See *Metals and Alloys*, Vol. 7, Apr. 1936, p. MA 204L/5. (3)

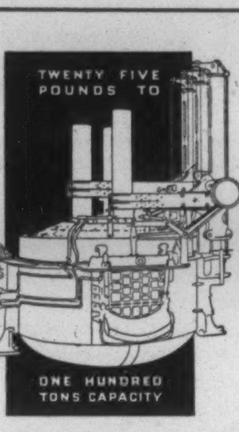
Foundry Machinery in Germany (Stand des Giessereimaschinenwesens in Deutschland) U. LOHSE. *Z. Ver. deut. Ing.*, Vol. 81, Jan. 9, 1937, pp. 39-42. **What May Foundry Practice Expect of the Moulding Machine?** IBID. *Foundry Trade J.*, Vol. 55, Nov. 26, 1936, pp. 407-410; Dec. 3, pp. 433-435. Up-to-date review. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 202L/8. Ha + AIK (3)

Gas-fired Rolling Furnaces Give Worthwhile Results on Wide Range of Metals. A. J. G. SMITH. *Am. Gas J.*, Vol. 146, Jan. 1937, pp. 14-15. Use of drum type melting furnace is described. Homogeneous metal is secured and the life of the lining is prolonged. European results in ferrous and non-ferrous foundry melting are discussed. CBJ (3)

Casting. *Steel*, Vol. 100, Jan. 4, 1937, pp. 307-308, 418-420. Presents opinions of various authorities on developments in the foundry industry during 1936. MS (3)

Reclamation, Conditioning and Handling of Foundry Sands. LESTER B. KNIGHT, JR. *Iron Age*, Vol. 138, Dec. 3, 1936, pp. 34-39, 119-120. *Foundry*, Vol. 64, Oct. 1936, pp. 26-27, 80. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 139L/9. VSP (3)

Distribution of Air in a Cupola and the Resistance which it Must Overcome, as a Function of Tuyeres Configuration. S. O. BIRULA & N. L. RADIMOV. *Liteinoe Delo*, Vol. 7, No. 10, 1936, pages 16-25. In Russian. Previous literature on blast furnaces and cupolas is extensively reviewed. Experiments were conducted in a model of natural size. Lower part of a cupola was reproduced by properly lining a steel plate cylinder 800 mm. diameter and 2000 mm. high, and providing it with tuyeres of different design and in different configuration and with proper measuring devices. The model was filled with coke, on the top of which a screen was placed to supply the extra pressure presented by the charge of a cupola of normal height. No Fe was charged, and the model was operated cold. Distribution of the blast was studied by introducing in it some MgO powder and observing color produced on the coke charge. After a run, coke was removed piece by piece and the color observed was sketched at different levels. 16 different types of tuyere arrangement and types were tried. Maximum blast intensity is observed in the plane of tuyeres, coloring being densest along their axes. At a certain height above the tuyere level color becomes uniform all over the cross section of the charge. This distance varies with the type of tuyeres. This uniform distribution persists for a certain height which varies also with the type of tuyeres. Large and small quantities of air produce the same distribution. (3)



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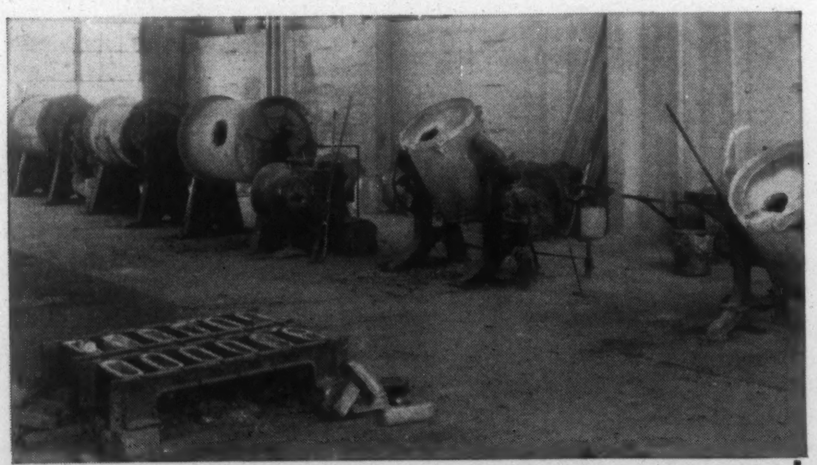

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3a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

Recovery of Selenium and Tellurium. J. F. WHITE (Can. Ind. Ltd.) *Can. Chem. Met.*, Vol. 21, Feb. 1937, p. 46. Practice at the Canadian Copper Refineries plant in Montreal East, Canada for the recovery of Se and Te. Blister Cu and anode Cu (from the Hudson Bay and Noranda smelters) carry .2-.25% of Se and Te, present as selenides and tellurides. In the tank house, they separate to the slimes along with the Cu, Au, Ag., etc. The dried slimes are acid roasted to remove much of the Se as oxide to the scrubber and make the Au soluble as sulphate. Te is oxidized largely to the tellurite. The "roasted slimes" are given a water leach to remove Cu, then mixed with soda ash, NaOH and sodium silicate and charged to the Doré furnace. Here more Se is fumed off as oxide; a No. 1 slag is removed and returned to the smelters, a No. 2 slag containing Te (and some Se) as the tellurite and tellurate is removed and the Doré metal containing the Au and Ag is removed. Au and Ag are separated in Moebius cells. The slag is water leached and the filtered solution is combined with the acid solution of the scrubber system. This operation yields a "neutralized mud" containing most of the Te and some Se and a "neutralized slag leach" high in Se and low in Te. The "neutralized mud" is given a water leach to remove Na salts. The residue is mixed with H_2SO_4 and roasted in a furnace. The Se is mostly roasted off and the Cu made soluble. The Cu is leached out and the residue is given an acid leach. This leach is treated with Na_2SO_3 to complete the removal of Se, NaCl is added and the solution gassed with SO_2 and the precipitated Te dried and cast with a resultant purity of 99.5%. WHB (3a)

Recent Developments in Light Metal Ingot and Billet Casting (Neuere Entwicklungsrichtung im Block-und Barrenguss von Leichtmetall) H. RÖHRIG (Lautawerk N.L.) *Aluminium*, Vol. 19, Feb. 1937, pp. 51-53; Discussion pp. 70-71. Modern casting methods that improve the uniformity of the casting and prevent the casting skin from entering the casting are briefly reviewed. The tilting mold, the dropping mold, molds without bottom, and the Hazelett casting process are described; in the last the metal is cast between two rolls provided with lateral flanges, the metal solidifies before the slot between the roll swith an extremely rapid cooling so that the disadvantages of slow cooling, aggregations of intermetallic compounds or the occurrence of orientated transcrystallization structures, or pipes, are eliminated. 4 references. Ha (3a)

Lead in Silicon Bronze May Cause Trouble. N. K. B. PATCH. *Foundry*, Vol. 65, Jan. 1937, pp. 34, 78. Si and Pb both have an affinity for O_2 and when Pb is added to Si bronze it may cause hard spots, making the bronze hard to machine. Gives an example in producing a certain type of brass casting similar to a pump valve. It was made from an 85-5-5-5 alloy. Trouble was encountered due to shrinkage resulting from lack of provision for feeding of heavy section. Shows how difficulty was corrected. VSP (3a)

Phosphor Copper Is Deoxidizer. *Foundry*, Vol. 64, Nov. 1936, pp. 28-29, 74. Practical. Discusses the deoxidation of bronze alloys with P-Cu. P has greater affinity for O than Cu, can be used to overcome porosity, and renders dull and sluggish metal fluid and lively. In some cases P may not be used, such as when a large volume of CO_2 is present. Since metals containing high % of P take up moisture and gases it is necessary to use sand of high permeability and metal should be poured so that no turbulence is set up within the mold. Considers also method of adding P-Cu and test used to determine the state of deoxidation of metal. Discusses a number of bronze alloys, giving their compositions. VSP (3a)

Better Machines Push Field for Die Castings. *Steel*, Vol. 100, Jan. 4, 1937, pp. 311, 421-422. Summarizes opinions of various authorities on developments in the die-casting industry during 1936. MS (3a)

Metallurgy of Copper. E. W. ROUSE. *Mining and Met.*, Vol. 18, Jan. 1937, pp. 19-20. Survey of progress in 1936. VSP (3a)

Alumina and Aluminium; Processes of Production. J. MÜRER, O. E. RÖMCKE & D. NICKELSEN. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 4. Describes processes used industrially. MS (3a)

Casting Technique and the Leipzig Fair (Giesserei-Technik und Leipziger Messe) J. MEHRTENS. *Leichtmetall*, Feb. 15, 1937, pp. 3-5. Descriptive. JZB (3a)

3b. Ferrous

C. H. HERTY, SECTION EDITOR

Possible Causes of Lack of Fluidity in Steel. R. H. GREAVES. *Iron & Coal Trades Review,* Vol. 133, Dec. 4, 1936, page 974. While viscosity is concerned with movements in the interior of a liquid, the reciprocal value of the coefficient of viscosity is defined as coefficient of liquidity or fluidity. Literature and experiments in this field are reviewed. P reduced fluidity, Mn increased it slightly, Si somewhat more, and S as MnS to a greater extent. True viscosity of steel is only a small multiple of that of water, and the kinetic viscosity considerably lower. The fluidity is influenced by surface tension of steel and mold sand, to some degree by the composition of the steel and by inclusions. Ha (3b)

Advantages of Brass Die Castings. J. C. FOX. *Modern Machine Shop,* Vol. 9, Dec. 1936, pages 56-64. Die, or rather "pressure," castings of brass are as strong as annealed mild steel, and may be produced more rapidly than sand castings and more accurately than ordinary castings or forgings. Suitable brasses and their mechanical properties listed. For good castings, the die-material must be specially selected. Ha (3b)

Research on Cast Iron. *Engineering,* Vol. 142, Nov. 13, 1936, page 527. Brief summary of the researches outlined in the Fifteenth Annual Report of the British Cast Iron Research Association. LFM (3b)

Steel Castings for the Electrical and Allied Industries. *Electrical Review,* Vol. 119, Nov. 6, 1936, pages 637-638. Brief description of the steel foundry of Messrs. Kryn & Lohy, Ltd., Letchworth, Eng. Very low C steel is produced in side-blown acid-lined converters fed by cupolas. Typical permeability curve is presented. MS (3b)

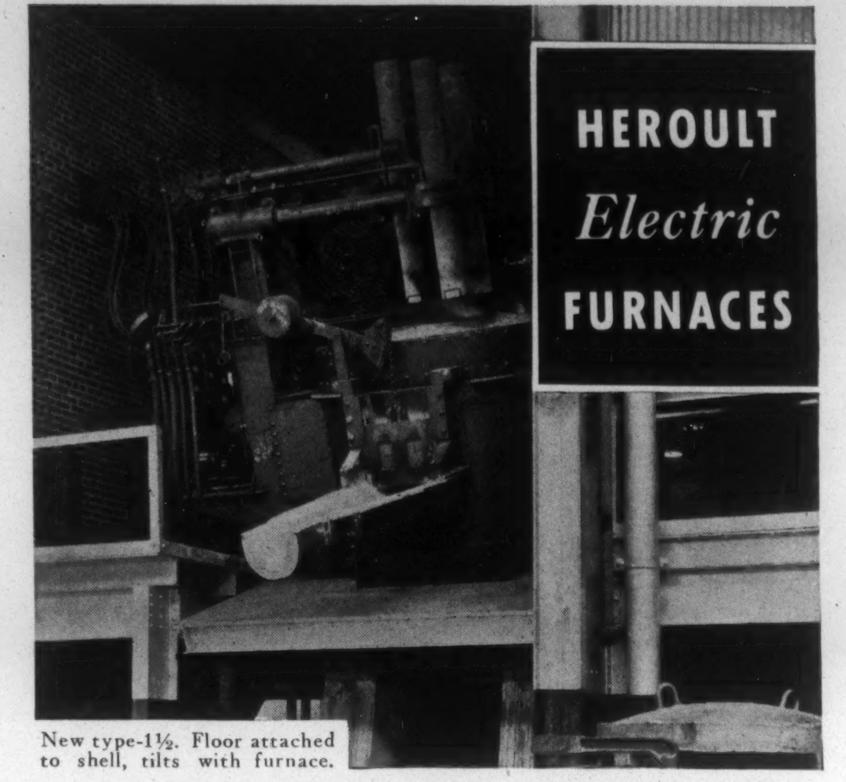
Steel Castings. *Times [London] Trade & Engineering,* New Series, Vol. 40, Nov. 1936, page 34. Deals with improvement in steel castings, essentials for production of good castings, effect of alloying elements, and applications. MS (3b)

Adopts Randupson Process for Making Ingot Molds. E. A. FRANCE, JR. *Steel,* Vol. 99, Nov. 16, 1936, pages 65, 67. Describes process used by Vulcan Mold & Iron Co., Latrobe, Pa. MS (3b)

Production of Low-Carbon Steel in the Basic Open Hearth from Scrap without Separate Manganese Additions (Erzeugung von weichem unlegiertem Stahl im basischen Siemens-Martin-Ofen aus Alteisen ohne besonderen Manganzusatz) H. WILHELM. *Stahl und Eisen,* Vol. 56, Nov. 26, 1936, pages 1423-1430. The scrap was melted, coal and other C-containing materials being added but no Mn. Low C steel with about 0.2% Mn was obtained. No hot-shortness was encountered in rolling or forging tests. Sheet and plate rolled from this material showed properties not much different from ordinary steel of this grade. SE (3b)

Dephosphorization of Steel in an Induction Furnace by Alkaline Slags (Die Entphosphorung von Stahl im kernlosen Induktionsofen durch alkalische Schlacken) H. SIEGEL. *Stahl und Eisen,* Vol. 56, Sept. 24, 1936, pages 1179-1184. About 0.05% P was added to induction furnace melts (in magnesia crucibles) of 0.1% C steel and the rate of dephosphorization by various basic slags observed. Adding sodium carbonate to slags high in lime and FeO made the slags much more fluid and resulted in rapid dephosphorization. SE (3b)

Properties of Steel which Affect the Quality of Steel Castings. R. H. GREAVES. *Foundry Trade Journal,* Vol. 55, Oct. 8, 1936, pages 268-270; Oct. 15, 1936, pages 291-293, 296; Oct. 22, 1936, pages 214-319. Communication from the Research Department, Woolwich, Section II of the Second Report of the Steel Castings Research Committee. Summarizes existing information relating to (1) some physical properties of liquid and solid steel which affect its behavior in the mold; and (2) the fluidity of steel in relation to the method of manufacture, composition and temperature of casting, with special reference to the practical application of the results of fluidity tests, volume changes from the liquid state to atmospheric temperature, total contraction from 1600° C. to atmospheric temperature, solid contraction, freezing contraction, the effect of practical conditions on shrinkage, hindered contraction, the strength and ductility of steel at temperatures near the melting point, forms of fluidity test-piece, possible causes of lack of fluidity in steel, foundry tests with spiral molds are discussed. The influence of the surface tension and the surface oxide films on fluidity also considered. AIK (3b)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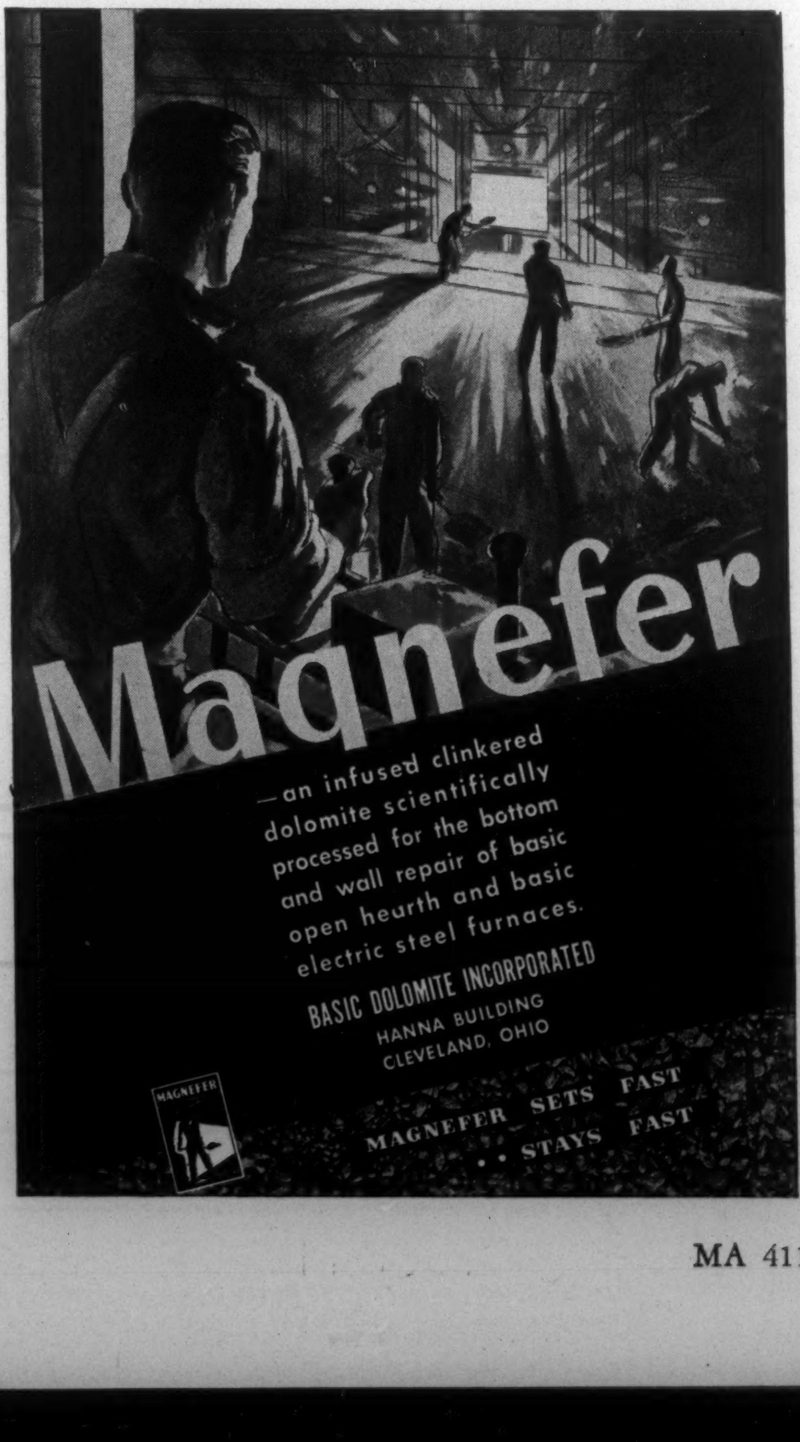

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Elliptical Shape Welded Steel Ladle Handles Large Tonnage of Hot Metal. *Steel,* Vol. 99, Nov. 2, 1936, page 73. Welded steel ladle weighing 31,000 lbs. and holding 120 tons of molten steel replaced older design weighing 55,000 lbs. and holding only 100 tons of hot metal. By making horizontal cross-sections elliptical rather than circular, capacity was increased without increasing height and without lengthening distance between trunnions. MS (3b)

Salt Coating on Ingot Molds Tends To Prevent Stickers and Scale. *Steel,* Vol. 99, Oct. 19, 1936, page 55. By dipping hot ingot-molds into a tank of NaCl brine, scale on molds is removed, and its formation is prevented. NaCl coating helps to prevent steel from sticking to sides of mold. Apparently, whether or not saturated brine is used makes little difference. Most effective temperature for dipping molds is about 500° F. MS (3b)

Microscopic Investigation of Processes of Dendritic Crystallization. B. E. Volovik & N. I. Yasirkina. *Metallurg,* Vol. 11, Oct. 1936, pages 27-34. In Russian. Crystallization of aqueous solutions of salts and of camphor were investigated under a microscope in order to illustrate probable behavior of crystals of steel on solidification. (3b)

Effect of Temperature upon Interaction of Gases with Liquid Steel. John Chipman & A. M. Samarin. *Metals Technology,* Jan. 1937, *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 784, 15 pages. Previous work has established the conditions of equilibrium in reactions of liquid Fe with steam at 1600° C. and with oxides of C at 1580° C. An experimental study was made, covering the range 1600 to 1770° C., of the reaction: $FeO(\text{in Fe}) + H_2 = Fe(\text{liq.}) + H_2O(g)$; $K = (H_2O)/(H_2)(\%FeO)$. At 1700° C. O content of Fe is proportional to steam/H_2 ratio in the gas, confirming results of previous investigations. The equilibrium constant is therefore independent of FeO content and is a function of temperature only. Experimental data are represented by: $\text{Log } K = 10,200/T - 5.50$. In order to apply experimental results to reactions involving other gases, a compilation was made of the thermodynamic properties of gases at 1600° C. as obtained by spectrographic methods. Equations were derived for change in free energy accompanying reactions involving the several gases, including their reactions with C. The calculated equilibrium constant of the reaction, $FeO(\text{in Fe}) + CO = Fe(\text{liq.}) + CO_2$; $K = (CO_2)/(CO)(\%FeO)$, is in agreement with Vacher's experimental determinations, which now may be extended by calculation to cover a wide range of temperature. Tables are given to show the effect of FeO and C in liquid metal on the composition of the equilibrium gas at several temperatures. The constant for the reaction of C with FeO in liquid steel is computed for several temperatures, and a table is given showing the product of % C by % FeO at atmospheric pressure and over a wide temperature range as a function of C content. Evolution of gas from rimming steel is discussed and it is pointed out that until the mechanism of gas evolution is more fully understood an exact thermodynamic treatment of the problem is impossible. Some features of the probable mechanism are suggested, including the postulate that the gases are evolved from an active film of liquid metal adjacent to the solid-liquid interface. A rough estimate of the composition of gases evolved from a low-C rimming ingot is made. 17 references. JLG (3b)

Influence of the Mold Material on Surface and Structure of Cast Iron (Der Einfluss des Formstoffes auf die Oberfläche und das Gefüge des Gusseisens) D. Dioszeghy. *Royal Hungarian Palatine-Joseph University of Technical and Economic Sciences, Faculty for Mining, Metallurgy and Forestry of Sopron,* Vol. 8, 1936, pages 301-310. Several Hungarian molding sands were examined with regard to behavior of the pure sand during casting, effect of the coal dust, and influence of mold material on microstructure of cast Fe. Because of chemical reaction between molten Fe and the sand, suitability of the latter should be determined not only with Seger cones, but by casting tests as well. $CaCO_3$ should be added to high-lime sands to prevent sticking of the sand to the casting; evolution of CO_2 from decomposition of the $CaCO_3$ keeps casting surface clean. With high C + Si irons the cooling rate (which differs with the type of sand) affects the microstructure of the casting. The outer zone of a casting made in high-lime sand is richer in pearlite than that of a casting made in low-lime sand but containing coal dust. An initially clean surface is therefore desirable, so that the thickness of the pearlitic zone need not be reduced by cleaning. Ha (3b)

Recent Developments in Open Hearth Furnace Design and Operation. L. F. Reinartz. *Blast Furnace Steel Plant,* Vol. 24, June 1936, pp. 496-498, 510; July 1936, pp. 594-597; Aug. 1936, pp. 714-716. *Heat Treating Forging,* Vol. 22, Aug. 1936, pp. 407-410; Sept. 1936, p. 476; Oct. 1936, pp. 529-531. See *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 535L/9. MS (3b)

Causes of Flakes in Steel. V. D. Krutitski & D. A. Maslanski. *Metallurg,* Vol. 11, Oct. 1936, pages 9-16. Data obtained in experimental rolling with varying cooling rate indicated a connection between flake formation and cooling speed. In C, Cr-Ni and Mn steels no flakes could be observed when the cooling rate remained under 15° C. per hr. Once formed, flakes cannot be eliminated by any treatment with the exception of hot working. This treatment extends cavities and partially welds them. Susceptibility of a metal to flake formation depends on melting practice. Cooling slower than 15° C. per hour in the interval between 400 and 150° C. prevents flakes in almost all steels. (3b)

Determination of High Temperatures. Measurements with a New Color Pyrometer (Ermittlung hoher Temperaturen. Messungen mit einem neuen Farbpyrometer) K. Guthmann. *Arch. Wärmewirt.,* Vol. 18, Feb. 1937, pp. 49-52. Discussion of new pyrometer. Measurements with the present optical pyrometers are inaccurate because of the uncertainty as to whether black body conditions exist. If the oxide film has a very different radiation from the metal, the error may be as high as 250° C. The true temperature is between the color temperature (which is too high) and the black body temperature (which is too low). In the new pyrometer color and intensity are compared with a standard by means of two wedges. The true temperature obtained is the average of these two readings and is correct to plus or minus 10° C. as compared with thermocouple readings. Examples are given of its application in the foundry, blast furnace operation, casting, etc. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 448L/3. JZB (3b)

Let's Take Off Another Heat. Don J. Reese. *Foundry,* Vol. 65, Feb. 1937, pp. 26-27, 87. Gives some details of proper cupola operations. One of the most important things is the use of good grade of foundry coke. The size of the coke should be 1/12th the diameter of the cupola. As to the quality of the coke, if a lot of steel is used and low total C for high strength Fe is wanted, hard, dense, high ash, slow burning coke should be used. If melting stove plate Fe and high total C is wanted, use a porous, soft low ash, fast burning coke. Fe and coke charges should be small in order to obtain better results. Proper bed height should be 45 in. with a wind box pressure of 16 oz. and a volume 2250 cu. ft./min. VSP (3b)

Hollow-electrode Furnace for Melting and Refining Stainless Steel Castings. D. M. Scott & A. W. F. Green. *Steel,* Vol. 100, Feb. 1, 1937, pp. 46-50; Feb. 15, 1937, p. 84. *Foundry,* Vol. 65, Feb. 1937, pp. 28-30, 88. Development of Ludlum Steel Co. Furnace used is an indirect-arc type, with hollow, horizontal graphite electrodes, inclined slightly toward arc, rotating at a very slow speed. Briquets of mixed Cr ore and powdered coke for refining bath are fed through electrodes. Size of feeders and risers on castings must be increased. Cr oxide inclusions are retained in steel, improving machinability. Castings possess excellent properties and corrosion resistance, and are unusually free from porosity. Tables of machining and tensile tests and photomicrographs are included. MS + VSP (3b)

Foundry Specializes in Difficult Jobs. Pat Dwyer. (Staff) *Foundry,* Vol. 65, Mar. 1937, pp. 22-24, 89-90. Describes the facilities of the Moline, Ill., plant of Frank Foundries Corp. The plant specializes in wear and heat resisting castings, pressure proof castings or other special physical properties outside the range of ordinary gray cast Fe. VSP (3b)

Packard Remodels Its Foundry. Pat Dwyer. (Staff) *Foundry,* Vol. 65, Feb. 1937, pp. 22-24, 82. Describes improvements made at the plant of Packard Motor Co., Detroit. Improvements were made in coremaking, sand handling and shakeout in existing foundry and erection of a new section housing additional molding units, sand preparation and distributing plant and a battery of 4 cupolas. VSP (3b)

Correlating Properties with Service Requirements. R. C. Heaslett. *Foundry,* Vol. 64, Dec. 1936, pp. 26-27, 71; Vol. 65, Jan. 1937, pp. 28-29, 81-82. Discusses several physical properties of Fe and steel castings that will be required of many castings in the future. VSP (3b)

Features Quality Castings. Pat Dwyer. *Foundry,* Vol. 64, Nov. 1936, pp. 22-23, 76. Describes method and equipment of the Keen Foundry Co., Griffith, Ind. VSP (3b)

Air Views on Slagging Spout. *Foundry,* Vol. 64, Nov. 1936, pp. 62, 64. Describes method of making a slagging spout that will not blow at tap hole. The cupola is lined to 78 in., uses both upper and lower tuyeres, 16 oz. blast pressure and melts 85 tons/day. Depth of molten metal behind dam seems to be the controlling factor. VSP (3b)

Ohio Ferro-Alloys Corporation
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4. WORKING

Some Aspects of a Study of Steel Tubes. J. W. Jenkin. *Proc. Staffordshire Iron Steel Inst.*, Vol. 51, 1935-1936, pp. 91-95. See *Metals and Alloys*, Vol. 7, July 1936, p. MA 345L/4. GTM (4)

Cold Rolling and Cold Pressing. J. W. Berry (Stourbridge Rolling Mills) *Proc. Staffordshire Iron Steel Inst.*, 1935-36, Vol. 51, pp. 22-41; discussion pp. 42-50. Comprehensive survey. See *Metals and Alloys*, Vol. 7, Apr. 1936, p. MA 182L/5. GTM (4)

4a. Rolling

S. EPSTEIN, SECTION EDITOR

Strip Mill Motors and Generators Cooled by Heat Exchanger Units. *Steel*, Vol. 100, Mar. 1, 1937, p. 66. Brief description of installation at hot wide-strip mill of Carnegie Illinois Steel Corp., Gary, Ind. MS (4a)

Armco Completes Cold Reduction Mill. *Iron Age*, Vol. 139, Jan. 21, 1937, pp. 28-30. Describes new cold reduction mill of the American Rolling Mill Co. This also involved the widening of its hot strip mill and the expansion of certain other processes. The maximum width of coils rolled is 74 in. and the average gage is 0.090 in. VSP (4a)

4b. Forging & Extruding

A. W. DEMMLER, SECTION EDITOR

Modern Forging Practice Is Well Integrated Technique. R. W. Thompson. *Steel*, Vol. 100, Feb. 8, 1937, pp. 42-44, 46-47. Discusses design of drop forgings, forging equipment, steels for die-blocks and for upsetter operations, and control of furnaces. Automobile has contributed most to advancement of drop forging. MS (4b)

New Type of Forging Equipment. *Heat Treating Forging*, Vol. 23, Feb. 1937, pp. 79-80. Warren Tool Co., Warren, O., has mechanism consisting of a furnace through which bars are conveyed to transfer-fingers which lift bars 1 at a time to a press, where they are successively moved forward and subjected to 6 forming operations, after which they slide into a tote-box. MS (4b)

4c. Cold Working — Shearing, Punching, Drawing & Stamping

The Metallurgical Aspects of Deep Drawing. J. D. Devons. *Iron Steel Ind.*, Vol. 9, April 1936, pp. 235-238; May 1936, pp. 277-282; July 1936, pp. 419-424; Sept. 1936, pp. 483-490; Nov. 1936, pp. 135-142; Dec. 1936, pp. 191-193. Unusually comprehensive review, under the headings: improvements in quality of metal during the past decade, failures and defects encountered during deep drawing, the nature and specification of desirable qualities in deep drawing metal, and a forecast of possible and desirable improvements in the metal and practice. CMS (4c)

Shearing Strip at High Speed. H. H. Talbot. *Blast Furnace Steel Plant*, Vol. 24, July 1936, pp. 591-592. **Flying Shears Have Many Applications in Modern Mills.** *Steel*, Vol. 98, June 29, 1936, pp. 57-58, 61. See *Metals and Alloys*, Vol. 7, Nov. 1936, p. MA 530R/7. MS (4c)

4d. Machining

H. W. GRAHAM, SECTION EDITOR

The Use of Hard-metal Tools in the Chemical Industry (Die Verwendung von Hartmetallwerkzeugen in der chemischen Industrie) Karl Becker. *Chem. App.*, Vol. 24, Feb. 10, 1937, pp. 33-35. Hard metals made in Germany, especially for working metals, vitreous and clay products are reviewed. All materials are made of sintered alloys consisting mainly of tungsten carbide, sometimes with additions of Co and titanium carbide. A selection of tools is illustrated. 4 references. HR (4d)

5. HEAT TREATMENT

O. E. HARDER, SECTION EDITOR

Controlled Heat Treating of Small Parts. H. P. Bristol (Bristol Co.). *Heat Treating Forging*, Vol. 23, Mar. 1937, pp. 115-117. Describes heat treating department of the Bristol Co. MS (5)

Heat Treatment as It Affects the Designer. Part I. Guy Hubbard. *Machine Design*, Vol. 9, Mar. 1937, pp. 29-32; **Part II**, Apr. 1937, pp. 26-28. General. Gives some metallurgical aspects about which "machine designers in general should be informed." Discusses some practical examples requiring a close cooperation between metallurgist and designer. EF (5)

Heat Treating Methods: A Discussion of Today's Practice. H. J. Gregg (Surface Combustion Corp.). *Ind. Gas.* Vol. 15, Apr. 1937, pp. 14-16. A general discussion of combustion systems, furnace atmospheres, and economical consideration. Ha (5)

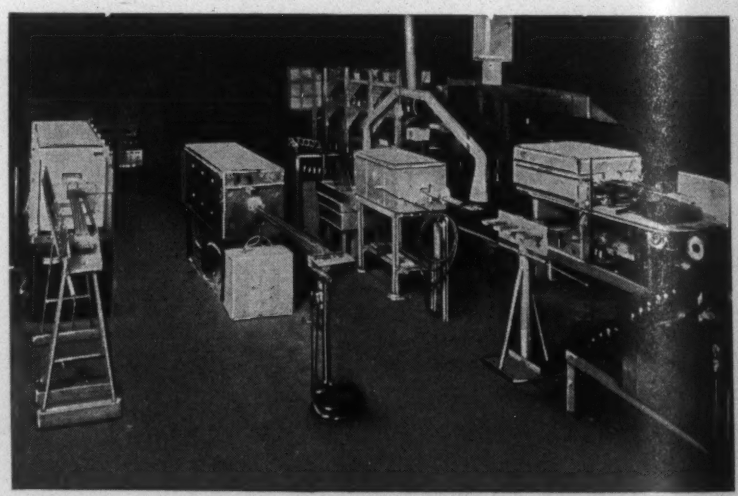
1936 Developments in Heat Treating and Forging. *Heat Treating Forging*, Vol. 23, Jan. 1937, pp. 13-14. Survey. MS (5)

5a. Annealing

Annealing Steel by Resistance Heating. *Steel*, Vol. 100, Jan. 25, 1937, page 61. Simple fixture applied to an electric resistance butt welder is used for annealing stampings quickly and effectively. MS (5a)

5b. Hardening, Quenching & Drawing

Die Blocks—Their Manufacture and Treatment. B. Pool. *Heat Treating Forging*, Vol. 22, July 1936, pp. 329-332. See *Metals and Alloys*, Vol. 7, Nov. 1936, p. 530 R/5. MS (5b)



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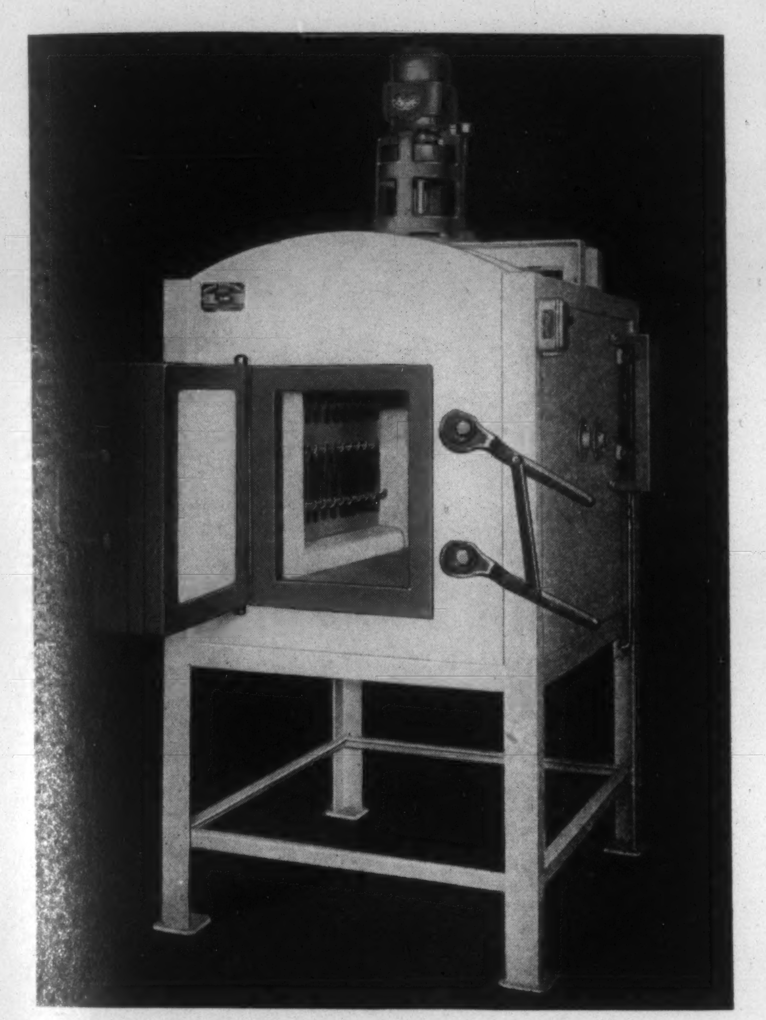

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6. FURNACES, REFRACTORIES AND FUELS

M. H. MAWHINNEY, SECTION EDITOR

Melting Furnaces for Light Metals (Leichtmetallschmelzöfen) FR. KNOOPS. *Elektrizitätswirtschaft,* Vol. 35, Sept. 25, 1936, pp. 710-712. A short review of a few German furnace types. EF (6)

The Significance of Electric Heat for the Improvement of the Quality of Metallic Materials (Die Bedeutung der Elektrowärme für die Werkstoffveredlung) O. DAHL. *Elektrizitätswirtschaft,* Vol. 35, June 25, 1936, pp. 465-468; July 15, 1936, pp. 529-532. Up-to-date review. EF (6)

Furnace Pressure and Temperature Control for Side Door Heating Furnaces. MARTIN J. CONWAY (Lukens Steel Co., Coatesville, Pa.). *Iron Steel Eng.,* Vol. 14, Apr. 1937, pp. 30-34; *Ind. Heating,* Vol. 4 Apr. 1937, pp. 296-308, 315-316; *Blast Furnace Steel Plant,* Vol. 25, Mar. 1937, pp. 303- 306; *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 196-199. *Iron Age,* Vol. 139, Apr. 15, 1937, pp. 34-39. **Automatically Controlled Heating Furnace Increases Metallic Yield by 1 Per Cent.** *Steel,* Vol. 100, Mar. 22, 1937, pp. 38-40, 66. Conditions inside and outside the furnace in their bearing on measurement and control of fuel flow, burner arrangement, combustion, output, and economies in recent design are discussed at length. Recuperative furnaces were found to be superior to regenerative furnaces. WLC + Ha + MS + VSP (6)

Development of Radiant-tube Heating for Industrial Furnaces. W. M. HEPBURN (Surface Combustion Corp.). *Machinery, N. Y.,* Vol. 43, Feb. 1937, pp. 373-374. Brief review and description of recent progress. Ha (6)

Modern Annealing Plant for a Continuous Mill. A. L. HOLLINGER & H. C. WELLER (Surface Combustion Corp.). *Metal Progress,* Vol. 31, Apr. 1937, pp. 389-395. Descriptive. WLC (6)

Improvements in Sheet Annealing Furnaces (Perfectionnements aux Fours de Recuit des Tôles) CHARLES HEURTEY. *Rev. Met.,* Vol. 34, Feb. 1937, pp. 161-165. A brief description of some present furnaces. JDG (6)

Recent Developments in Refractories. CHRISTOFER E. MOORE. *Proc. Staffordshire Iron Steel Inst.,* Vol. 51, 1935-36, pp. 74-84; discussion, pp. 84-90. Review of developments in the production of fire bricks and other special refractory materials. GTM (6)

Oil Fired Heat Furnaces. YOSHIJIRÔ GO (Japan Steel Tube Co.). *Tetsu-to-Hagane,* Vol. 23, Mar. 25, 1937, pp. 284-288. In Japanese. Descriptive of the nature of oil used in heating furnace, its handling, and firing arrangement adopted by Japan Steel Tube Co. NS (6)

Selection of most Suitable Resistor Material in Electrical Furnaces (Wahl geeigneter Baustoffe in elektrischen Widerstandsöfen) WILHELM FISCHER. *Elektrizitätswirtschaft,* Vol. 35, Sept. 25, 1936, pp. 701-702. Superficial comparison of Ni-Cr, Fe-Cr-Al and Si-C as resistor materials. EF (6)

Heat Treatment of Light Metals (Vergüten und Veredeln der Leichtmetalle) FR. KNOOPS. *Elektrizitätswirtschaft,* Vol. 35, Oct. 15, 1936, pp. 750-752. Descriptive. 7 out of 8 illustrations show furnace types used in German practice for heat treating Al alloys. EF (6)

Backing Up Refractories with Insulating Material. G. E. GRIMSHAW (Johns-Manville). *Steel,* Vol. 100, Apr. 12, 1937, pp. 89-90, 92, 94; Apr. 19, 1937, pp. 51, 54, 56, 59. Describes insulating materials used, important physical and thermal properties and methods of testing, and discusses selection of proper material and economical thickness. Includes tables and charts. MS (6)

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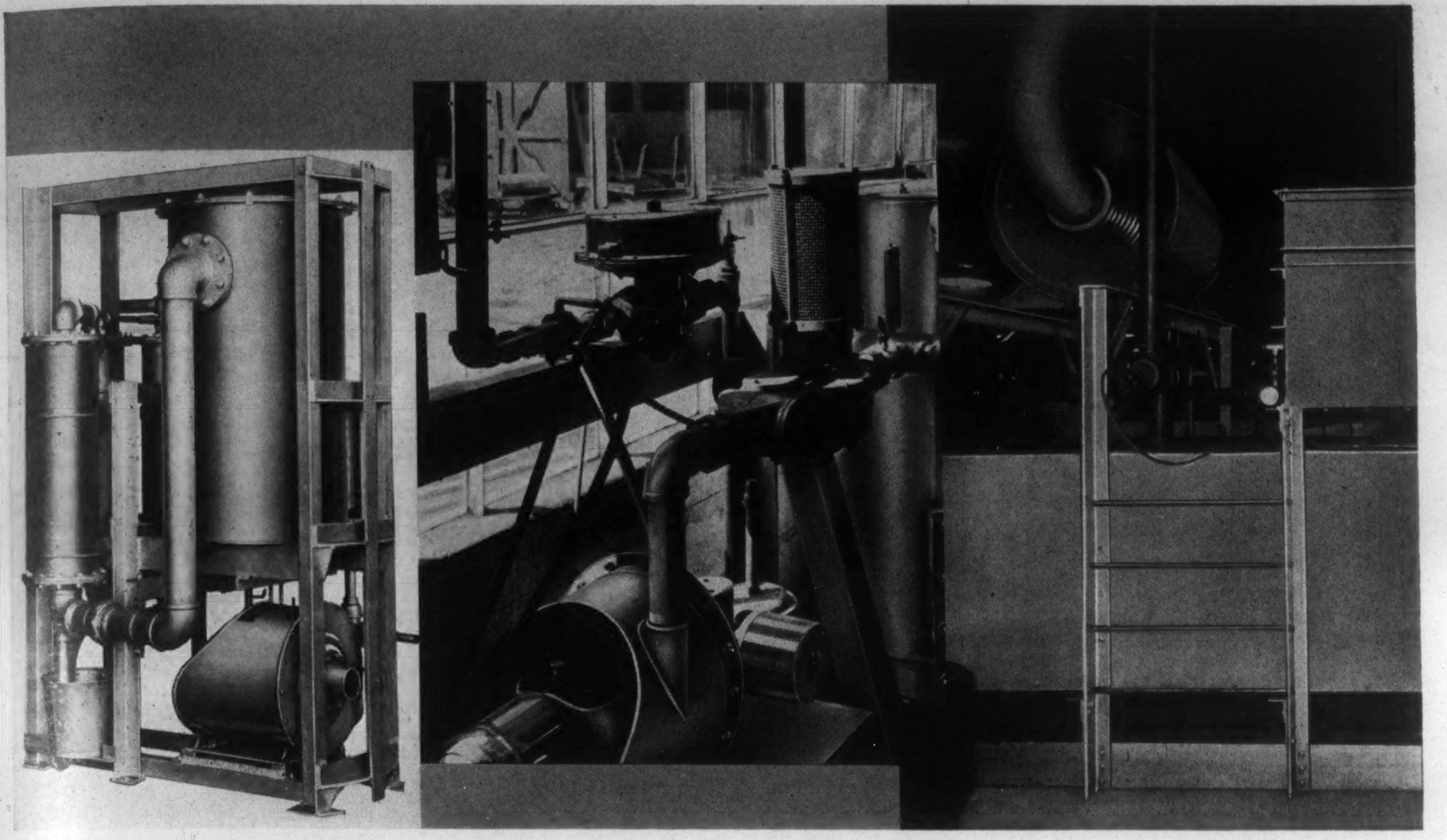

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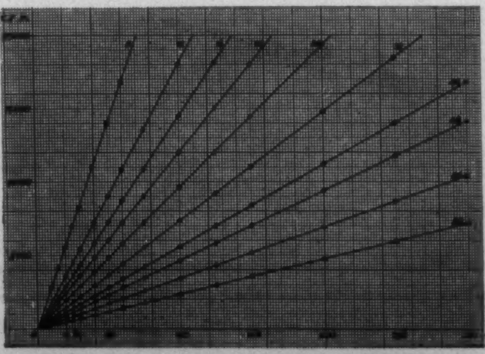

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7. JOINING

7a. Soldering & Brazing

C. H. CHATFIELD, SECTION EDITOR

The Use of Silver in Modern Brazing. HERBERT E. BENNETT. *Metal Treatment,* Vol. 2, Autumn 1936, pp. 130-131. Ag solders are replacing the older brazing brasses, the Ag additions lowering the melting point and giving free-flowing, strong, ductile alloys of improved corrosion resistance. "Sil-fos" is an alloy of Cu with 15% Ag and a small amount of P. It melts at 705° C., is free flowing, and needs little flux. Ag solders containing Mn are used with stainless steel. JCC (7a)

Use of Silver Solders. R. H. LEACH. *Sheet Metal Ind.,* Vol. 10, Dec. 1936, pp. 969-970. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 154L/1. AWM (7a)

Fluxes for Use in Soft-soldering. J. W. WILLSTROP, A. J. SIDERY, & H. SUTTON. *Sheet Metal Ind.,* Vol. 10, Oct. 1936, pp. 779-780. *Chem. Trade J.,* Vol. 99, Sept. 18, 1936, p. 231. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 152R/8. AWM + MS (7a)

7b. Welding & Cutting

E. V. DAVID, SECTION EDITOR

Electric Welding at the Works of Robey & Co., Ltd., Lincoln. *Welder,* Vol. 8, Nov. 1936, pp. 1134-1136. Descriptive survey, with photos of equipment welded, of application of welding in plant which has used the method of construction for 22 years. Much of the work requires flanging after welding and failure during bending does not occur. WB (7b)

Multi-cylinder Portable Welding Sets. *Welder,* Vol. 8, Nov. 1936, pp. 1131-1133. Descriptive of new Murex welders of welded construction. WB (7b)

How Design for Welding Defers Obsolescence and Increases Profits for Manufacturers and Users of Metal Products. ERICK OBERG, (Machinery, N. Y.) *Intern. Acetylene Assoc.,* Nov. 1936, 16 p. preprint. Review of advantages in welding and flame cutting for machinery construction due to flexibility of the processes and design. Development of flame cutting has enabled production schedules to be speeded up and large savings to be made. Ideal sections with lowest weight to carry a load or greater rigidity are most easily fabricated by welding, which in a casting would require complicated core work, etc. Other favorable comparisons are made and discussed. Weld designer must design on basis of yield strength of weld metal in many cases and for shock resistance in large power machinery. Repair and hard facing by welding are briefly referred to. WB (7b)

Structural Changes of Mild Steel During Welding and their Effect upon the Strength of Ship Members (Gefügeänderungen des Flussstahles beim Schweissen und deren Einfluss auf die Festigkeit der Schiffsverbände) A. J. MLADIATA. *Werft, Reederei u. Hafen,* Vol. 17, Dec. 15, 1936, pp. 401-402. Due to considerable local overheating during arc welding, structural changes take place which materially affect the dynamic resistance of structural steels used in ship building. The tightness of joints due to shrinkage stresses and high-seas pounding was impaired. Impact and tensile tests were carried out on mild steel samples welded with electrodes containing .009 C, .35 Mn, .17 Si and .03% P. EF (7b)

Electric Welding Cast Iron. C. D. MCFALLS. *Ind. & Welding,* Vol. 10, Mar. 1937, pp. 17-18. Brief review of practical details for successful welding. Low C (.06% max.) coated rod is considered best, C arc successful if properly handled, steel electrode poor practice due to hardened areas and porosity; studded weld is also successful. Arc weld with flux-coated electrode of 1/8" max. diam. gives low heat effect. Other electrodes are Cu, Monel, cast Fe. WB (7b)

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Welding at the International Association for Bridge and Structural Engineering. Berlin-Munich, Germany, Oct. 1936. *Welder,* Vol. 8, Dec. 1936, pp. 1160-1164. Summaries of some papers at the meeting are given. Fatigue testing and calculations for fatigue safety for weld design are discussed. Safety factors adopted for welded connections are on a par with those for riveted joints. Development of electrodes and use of high grade welding steel is noted. Residual stress, effect of type of weld and welding method in internal stresses, are reviewed. The thermally disturbed areas next to the weld are critically surveyed with suggestions of study to determine effect of type of current, electrode composition, diameter and cross section of structural members. Precautions are to remove disturbed areas out of highest stressed zones, grind weld smooth in some cases, standardization of welding equipment and methods. The idea that the old, traditional riveting can be replaced by cheap welding is untenable since welding is complicated art and requires constant supervision for success. Control of effects of shrinkage in internal stress, warping, etc., are considered as reduction of weld size, low-heat electrodes, sequence welding, speed of welding, reduction in number of layers in weld. Control in fillet welds is less favorable. Cracking of welds and factors favoring cracking are discussed and danger of cold hammering to reduce stress, shown to be applicable only to steels that do not tend to form microscopic cracks. Testing of welds by X-raying is briefly discussed.
WB (7b)

Some Distribution in Irregular Sections Using Photo-elastic Models. T. V. MATTHEW. *J. Roy. Tech. Coll., Glasgow,* Vol. 4, Part I, Jan. 1937, pp. 121-134. Original research. The distribution of two-dimensional stress in welded joints and irregular sections is described using transparent models with photo-elastic properties. Comments made on the necessity for adequate allowances for high stress concentrations; the dangerous effect of irregularities in a stressed section in forming points of high stress concentration is also demonstrated, especially where sharp changes of shape occur, and the necessity for complete penetration stressed. Adequate fillets or flush finishing in welded joints is shown to be essential if a full development of the joint strength is to be obtained.
JWD (7b)

What About Your Oxy-acetylene Regulator? E. L. MATHY (Victor Equipment Co.) *Ind. & Welding,* Vol. 10, Mar. 1937, pp. 23-27. Critical discussion of regulator faults and cure. 3 designs of regulators indicated as (1) delivery pressure drops with cylinder pressure (2) delivery pressure increases with lower cylinder pressure due to the seat being closed by means of the stream of high pressure gas, (3) two stage regulator where delivery pressure is constant as set. Due to creep of seat full pressure may be put on low pressure side and safety is in high strength diaphragm and pressure release to prevent hose or regulator failing. Spontaneous combustion in O cylinder is possible from oil or grease on seat or sudden rise in temperature due to rapid compression of residual O. Impact friction of particles in stream an auxiliary cause.
WB (7b)

Autogenous Welding for Repairing and New Parts (Autogenschweissung bei Reparaturen und Neuherstellungen) W. RAABE. *Autogene Metallbearbeit.,* Vol. 30, Mar 1, 1937, pp. 72-75. A number of examples are given to illustrate the many possibilities for economical use of oxy-acetylene welding.
Ha (7b)

The Gas Welding of Silumin Castings (Das Gasschmelzschweissen von Siluminguss) H. REININGER (Metallgussgesellschaft m. b. H. & Edmund Becker & Co.) *Leichtmetall,* Feb. 15, 1937, pp. 6-16. Review plus original research. Casting defects of normal (Al 87%, Si 13%) and Cu silumin may be repaired by welding. The defect should be well cleaned before welding. A welding rod of the same composition as the casting should be used but no flux is necessary. The welding should be done rapidly and the molten metal stirred as little as possible to prevent excess oxidation. The blue reducing cone of the flame should not touch the metal. After welding, the casting should be heat treated for at least 4 hrs. at 300-350° C. to relieve strains.
JZB (7b)

S_1 (Strength) + S_2 (Symmetry) → M. D. (Modern Design). A New Formula. C. S. ROBERTS. *Fab. Progress,* Dec. 1936, pp. 141-142. Education of the user of steel is needed to overcome the impression that all castings are fragile, obtained from consumer experience with cast Fe toys and appliances that "couldn't take it." Modern cast steel has high strength, is ductile and can be put through all the operations of bending, cutting, hardening, heat treatment that are possible with rolled steel. Combination of cast steel with rolled plate, tubes, etc., by welding or of cast steel with other steel castings (latter for foundry economy, former for low fabrication costs) where complicated shapes are required are urged upon equipment manufacturers.
WB (7b)

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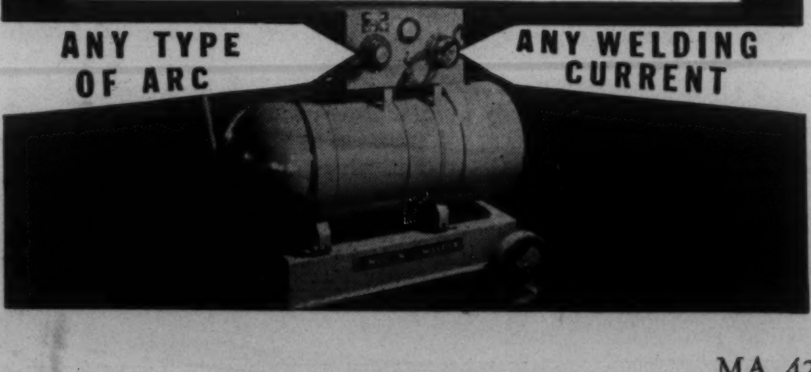

Fire-proof . . . Explosion-proof . . . Collision-proof. R. S. Robinson. *Fab. Progress,* Dec. 1936, pp. 143-145. Descriptive. Gasoline tank trucks are discussed, as evolved by welding. Destruction tests of N. Y. City Bureau, by fire and dropping when filled with water were successfully passed by welded tank and truck bodies. Indications are that although severe deformations may take place, no leaks will occur, owing to ductility and strength of welds. WB (7b)

Economics of Electric Welding. A. E. Rogers. *Chem. Eng. Mining Rev.,* Vol. 29, Dec. 8, 1936, pp. 115-117. Factors are considered that influence the selection of equipment. WHB (7b)

A New Oxy-acetylene Welding Method. F. E. Rogers. *Ind. & Welding,* Vol. 10, Feb. 1937, pp. 24-25. French method of gas welding unchamfered plates set up with opening ½ the plate thickness is described. Good properties and penetration were obtained with high welding speed. WB (7b)

Weld Designs Good and Bad. Bela Ronay. *Welding Engr.,* Vol. 17, Jan. 1937, pp. 24-25. The use of more liberal included angle for chamfer of V welds is advocated for improving penetration to root of V. Lack of penetration to bottom of V is considered due to concentration of arc flame on sides of kerf because of bifurcated arc. Root spacing is required to be 1½ times nominal diam. of rod. Additional safety is obtained by use of backing strip, removal and reweld of first layer. WB (7b)

Spot- and Roller Seam Welding of Light Metals (Die Punkt- und Rollennahtschweissung von Leichtmetallen) F. Rosenberg. *Aluminium,* Vol. 19, Feb. 1937, pp. 89-97. Resistance welding methods for Al and Al alloys are discussed and reviewed exhaustively, and the equipment, automatic and manual, described. In spot welding, the strength of the spot is superior to that of a rivet. 12 references. Ha (7b)

Non-destructive Tests. E. C. Rollason. *Welder,* Vol. 9, Jan. 1937, pp. 6-11, 25. Review of tests applied to welded structures which are enumerated as pressure, magnetic (oscillograph type developed by Bureau of Standards) magnetic dust, weld meter (to test formation of magnetic poles) electrical, acoustic, ultra sound (supersonic) X-ray radiography and spectroscopy, gamma radiography tests. The methods are briefly described and some are evaluated from the literature. The X-ray spectroscopy method is recommended for use as a research tool to indicate the grain size, orientation, internal stress and recrystallization of the weld and transition zones of a weld cross-section. WB (7b)

A General Survey of Metallic Arc Welding with Particulars of Some Welded Products. J. M. Polson & D. G. Sinfield. *Welding Ind., London,* Vol. 4, July 1936, pp. 238-252. Comprehensive review with large amount of experimental data on physical properties of weld metal. Discussion of heat effect on parent metal. WB (7b)

Welded Structural Designing. H. M. Puddy. *Welder,* Vol. 8, Nov. 1936, pp. 1123-1125; Dec. 1936, pp. 1155-1159; Vol. 9, Jan. 1937, pp. 4-5. Examples of rigid construction are given and strength factors in weld design for butt and fillet welds are discussed and assembly methods shown in photos. The main idea in design is to obtain simplest connection possible and to utilize the metal to its utmost capacity which is possible when the design is based on calculations for rigid joints obtained by welding. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 94R/2. WB (7b)

Welding of Thin Sheets (Beitrag zur Frage der Dünnblechschweissung) C. Schröder. *Autogene Metallbearbeit.,* Vol. 30, Feb. 1, 1937, pp. 39-41. Original research. Experiments with thin Fe and Cu sheets showed that the frequent warping of the sheets can be avoided by concentrating the heat on the seam and by preventing the spreading of the heat. This was achieved by using a burner that blows cooling air on both sides of the flame on the sheet. Ha (7b)

Notes on Welding as Applied to Trackwork. N. W. Swinnerton. *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 284-288. Detailed discussion of procedures used and hardness developed in weld and transition zone for various analyses of rail welded with and without preheat. WB (7b)

Oxy-acetylene Welding in the Operation and Maintenance of Pipelines. R. P. Gonzales (Arkansas Louisiana Gas Co.) *Intern. Acetylene Assoc.,* Nov. 1936, 6 p. preprint. *Welding Eng.,* Vol. 22, Feb. 1937, pp. 20-21. Review of maintenance and new pipe line welding requirements. Pipe bevelling machines are used for removing damaged sections and to salvage pipe by cutting and rewelding sections. Because of fire hazard a section of the gas line is cut off at mainline gate valves. WB (7b)

How the Microscope Can Help the Welder. J. D. Jevons & M. A. Wheeler. *Welding Ind., London,* Vol. 4, Oct. 1936, pp. 356-360; Nov. 1936, pp. 396-400; discussion, Dec. 1936, pp. 438-439. Reviews use of microscope for determining presence of inclusions, nitrides, lack of fusion, over-heating, alloying at fusion line and cracking for spot welds. The absence or presence of decarburization, control of Cu, brazing, etc., are discussed. WB (7b)

Track Welding Practices of the Chicago Surface Lines. Jonathan Wolfe. *J. Western Soc. Engrs.,* Vol. 41, Dec. 1936, pp. 361-371. Descriptive. Applications of welding in general use on Chicago surface lines include: (1) rail joints, (2) repairing worn special trackwork, (3) building up cupped T joints, (4) welding negative cables to the rails, (5) burning apart old rails and steel to facilitate removal as scrap, and (6) fabrication of special work by welding. Cast welds, resistance, C-arc seam and thermit welds are employed. Oxyacetylene welding is here confined to burning and cutting. WHB (7b)

Heat Effect in Welding. W. G. Theisinger. *Iron Age,* Vol. 138, Oct. 15, 1936, pp. 81-82, 86, 88, 90, 92; Dec. 17, pp. 38-45; Vol. 139, Feb. 25, 1937, pp. 28-31, 115; Mar. 4, pp. 48-53. Outlines method and conclusions of study of the variables which affect the welding of steel, with particular reference to the effect of welding heat on the parent metal adjacent to the weld. Considers C and various alloy steels. Results show that as the hardening power of base metal is raised, the hardness of affected plate metal adjacent to a weld is increased. For increase in hardening power of base metal, the heat energy input of welding process should be raised by use of higher amperage or reduced welding speed. C exerts the greatest influence in increasing susceptibility of base plate to harden after welding. Speed of welding should be considered seriously when hardenable steels are welded. Intermediate speeds are most desirable. VSP (7b)

Electric Arc Welding Machine. J. M. Willey. *Welding Ind., London,* Vol. 4, June 1936, pp. 202-212. Complete, thorough review with tabulated data, curves and numerous cost figures for various type of machines. WB (7b)

Stainless Steel Sulphur Dye Tanks Are Fabricated by Oxy-acetylene Welding. *Steel,* Vol. 99, Sept. 7, 1936, p. 45. Descriptive. MS (7b)

Gas Welding of Class 1 Pressure Vessels. G. W. Plinke. *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 279-281. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 450 R/5. WB (7b)

Stack Cutting of Plate Material for Manufacture of Steel Parts Required for Heavy Repairs to Steel Freight Cars. B. F. Orr. *Welding Engr.,* Vol. 22, Jan. 1937, pp. 39-41. **Stack Cutting Saves Time in Heavy Repairs to Freight Cars.** Ibid. *Steel,* Vol. 100, Mar. 1, 1937, pp. 44-46. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 89R/9. WB + MS (7b)

Hard Facing Mining Machine Bits at the Wheelwright Mine of the Inland Steel Company. John T. Parker. *Proc. Illinois Mining Inst.,* 1936, pp. 112-119. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 94R/9. AHE (7b)

Light-weight Hopper Car Increases the Pay Load. W. E. Palmer. *Welding Engr.,* Vol. 22, Jan. 1937, pp. 34-35. Descriptive, with details of weight saved by weld construction using low alloy steels. WB (7b)

Testing Methods in Workshop and on Site. M. Pinczon. *Welding Ind., London,* Vol. 4, Oct. 1936, pp. 338-342; Nov. 1936, pp. 369-371. General review of methods of evaluating welds. WB (7b)

Welding as Applied to Heavy Machinery and Marine Engineering. H. N. Pemberton. *Welding Ind., London,* Vol. 4, Mar. 1936, pp. 67-76. See also *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 450R/6. WB (7b)

Electrically Welded Spiral Guided Gasholders. H. H. Hollis. *Welding Ind., London,* Vol. 4, Feb. 1936, pp. 3-7. See *Metals and Alloys,* Vol. 7, Jan. 1936, p. MA 16L/9. WB (7b)

The Appearance of Welded Plant. J. Hinde. *Welding Ind., London,* Vol. 4, Feb. 1936, pp. 8-9. WB (7b)

Welding for High Temperature Service. J. Hinde. *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 256-257, 264. General; discusses alloy steels. WB (7b)

Permanency of Oxy-acetylene Welding. F. C. HUTCHINSON. *Welding Ind., London,* Vol. 4, Feb. 1936, pp. 10-12. Low maintenance labor, permanently leak-proof lines cited for welded pipe. WB (7b)

An Interesting Marine Boiler Repair. T. T. JACKSON. *Welding Ind., London,* Vol. 4, Sept. 1936, pp. 291-293. Details. WB (7b)

The Repair of Windlass Cylinder Castings. T. V. JACKSON. *Welding Ind., London,* Vol. 4, Nov. 1936, pp. 364-365. Descriptive, practical. WB (7b)

Welding in Colliery Maintenance. J. K. JOHANNESEN. *Welding Ind., London,* Vol. 4, Jan. 1937, pp. 445-447. Repair welding discussed for heavy, cast equipment. WB (7b)

Welding in the Service of the Quarrying Industry. J. K. JOHANNESEN. *Welding Ind., London,* Vol. 4, Apr. 1936, pp. 96-97. Discusses hardfacing. WB (7b)

Site Welding of Pressure Vessels. J. K. JOHANNESEN. *Welding Ind., London,* Vol. 4, Oct. 1936, p. 326. Brief, with detailed sketch. WB (7b)

Repair of a Torn Shear Body of Steel by Autogenous Welding (Wiederherstellung eines zerrissenen Scheerenkörpers aus Stahl durch autogene Schweissung) H. H. GRIX. *Autogene Metallbearbeit.,* Vol. 30, Feb. 1, 1937, pp. 38-39. Describes procedure. Ha (7b)

Repairing of Aluminum Castings by Welding Processes. W. HERMANN & EDMUND R. THEWS. *Welding Ind., London,* Vol. 4, Apr. 1936, pp. 90-94. Details given. WB (7b)

Welding a Three-story Building. P. L. ROBERTS. *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 275-278. Constructional details. WB (7b)

Manual Welding of Light Gauge Sheet Metal with the Carbon Arc—Apparatus and Technique. R. HARRIS & L. FERNEY. *Welding Ind., London,* Vol. 4, Jan. 1937, pp. 442-444. Illustrated account of various C arc welds which are considered particularly suitable for edge, corner joints and overlapped welds where excess metal is used for filler. Details as to C diam. for various gages, methods, etc., are included. Use of a paste is essential for good C-arc welding. WB (7b)

Fusion Welded Power Piping Standards for Quality of Welding and Methods of Inspection. WILLIAM D. HALSEY (Hartford Steam Boiler Inspection and Insurance Co.) *Intern. Acetylene Assoc.,* Nov. 1936, 12 p. preprint. **Standards for Welding Quality and Methods of Inspection of Fusion Welded Power Piping.** IBID. *Welding Engr.,* Vol 21, Dec. 1936, pp. 38-41. Review, of interest in inspection primarily for safety of equipment. Discussion of procedure, qualifications, testing for pressure vessels and piping. In welder qualification tests strength and ductility are of secondary importance to production of sound weld free of unfused areas and porosity. From psychological side it is considered better to cut out random section of weld for inspection than have welder make test weld plates, in that continued effort is demanded in first case. WB (7b)

The Question: Core Electrodes or Mantle Electrodes (Zur Frage: Seelenelektroden oder Mantelelektroden) R. HACKERT & K. L. ZEYEN. *Tech. Mitt. Krupp,* Vol. 5, Feb. 1937, pp. 22-31. Review plus original research. Experiments with modern coated welding electrodes show that the mechanical properties of welds with these electrodes are just as satisfactory as with bare electrodes. It is maintained that each type has its own field and should be suitably applied. Ha (7b)

The Use of Welding in the Fabrication of Steel Plate Framework Using Pressed Plate Sections. E. MOPIN. *Welding Ind., London,* Vol. 4, Nov. 1936, pp. 386-391; Discussion, Dec. 1936, pp. 435-437. Details of construction by welding. WB (7b)

Large "Y" and Reducer Section Welding. F. G. SHERBONDY. *Welding Engr.,* Vol. 21, Nov. 1936, pp. 42-43. Design details. WB (7b)

Fusion Welding of Boilers, Pressure Vessels and Piping Under Code Requirements. ERIC R. SEABLOOM. *Welding Engr.,* Vol. 21, Nov. 1936, pp. 44-47. WB (7b)

Westinghouse Completes All-welded Building. EDWARD H. SYKES. *Welding Engr.,* Vol. 22, Jan. 1937, pp. 36-37. Descriptive. WB (7b)

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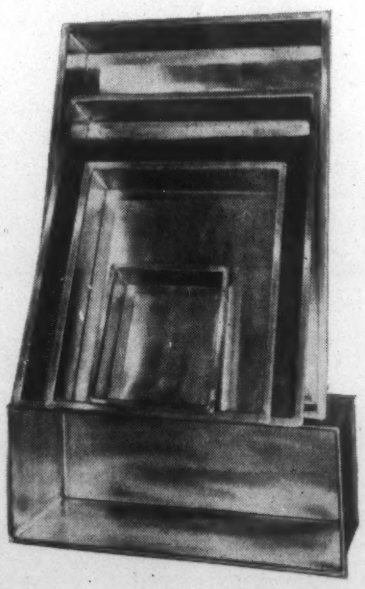

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Welded Stainless Steel in Notable Kitchens. EDWARD H. SYKES. *Welding Engr.,* Vol. 21, Dec. 1936, pp. 26-27. Photos of equipment. WB (7b)

The Construction of Automobile Chassis—Spot Welding at the Works of Vauxhall Motors Ltd. W. D. LAURIE. *Welding Ind., London,* Vol. 4, Mar. 1936, pp. 44-47. WB (7b)

Autogenous Welding (Soudure Autogène) LANGUEPIN. *Usine,* Vol. 46, Jan. 7, 1937, p. 31. The advantages of welded and cast base plates of machines are compared and application of welded structures in France and other countries briefly discussed. Ha (7b)

Lining Tanks with Stainless-clad Steel. W. B. KEELOR (Borg-Warner Corp.) *Welding Engr.,* Vol. 17, Jan. 1937, pp. 21-22. *Ind. & Welding,* Vol. 10, Feb. 1937, pp. 68-69. Details are given for lining riveted or butt welded tank with 16 gage 18-8 steel sheet by lap welding. WB (7b)

Welding of Alloy Steels. A. B. KINZEL. *Sheet Metal Ind.,* Vol. 10, Dec. 1936, pp. 971-972. Discusses the welding of the low-alloy, high-strength steels. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 219L/6. AWM (7b)

Welded Track Joints in Coal Mines. G. STUART JENKINS. *Proc. Illinois Mining Inst.,* 1936, pp. 80-81. The welding of track joints is described. Costs are 68¼ cents per joint as compared with $1.004 for bonded joints. AHE (7b)

After-Streamlining—the Modern Trend in Ship Construction and Repair. J. K. JOHANNESEN. *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 254-255. General. WB (7b)

Hardening Cast or Rolled Steel with the Oxyacetylene Flame. G. V. SLOTTMAN. *Welding Eng.,* Vol. 21, Dec. 1936, pp. 28-29. Practical. Methods, equipment and results obtained are briefly discussed and illustrated. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 212R/1. WB (7b)

The Jobbing Welder. W. SLADE. *Welding Ind., London,* Vol. 4, May 1936, pp. 148-149; Aug. 1936, pp. 265-266. Practical discussion of repair of cracked equipment, repair of malleable Fe castings. WB (7b)

The Polish Type of Gas-welded Rail Joint. Laboratory Tests and Practical Applications. F. GOLLING & D. TULACZ. *Welding Ind., London,* Vol. 4, June 1936, pp. 165-169. Review of practice in Poland; with illustrations. WB (7b)

A Method of Determining the Properties of Welding Generators. L. A. FERNEY. *Welding Ind., London,* Vol. 4, July 1936, pp. 216-218; Sept. 1936, pp. 294-298. WB (7b)

Jointing of Materials by Welding—Applications in the Aircraft Industry. R. H. DOBSON & R. F. TAYLOR. *Welding Ind., London,* Vol. 4, Apr. 1936, pp. 99-104. Extended abstract. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 217L/5. WB (7b)

General Design for Welding. J. A. DORRAT. *Welding Ind., London,* Vol. 4, Jan. 1937, pp. 471-476. Review of design fundamentals with regard to allowable stress, minimum weld size and technique and processes. Weld design should aim at putting welds where stresses are low, making smaller weld possible. WB (7b)

Welded Pressure Vessels and Containers. C. H. DAVY. *Welding Ind., London,* Vol. 4, Feb. 1936, pp. 31-38; Discussion, Mar. 1936, pp. 76-81. A review of papers on this subject presented at a British Symposium on Welding. See *Metals and Alloys,* Vol. 7, Aug. 1936, p. MA 409L/6. WB (7b)

The Country Job Shop Goes to Town. A. F. DAVIS (Lincoln Elec. Co.) *Ind. & Welding,* Vol. 10, Feb. 1937, pp. 26-32. Commercially practical, illustrating where the need for welding exists. WB (7b)

How Arc Welding Cuts Costs of Jigs and Fixtures. A. F. DAVIS (Lincoln Elec. Co.) *Iron Age,* Vol. 138, Oct. 8, 1936, pp. 56-57; Nov. 19, pp. 46-48; Vol. 139, Mar. 25, 1937, pp. 38-39, 51. Discusses the advantages of arc-weld fabrication, the savings accomplished in tooling costs and simplified tooling procedure. VSP (7b)

Welding Hard Facings on Drilling Tools. J. CUTHILL. *Welding Ind., London,* Vol. 4, Mar. 1936, pp. 58-61. See *Metals and Alloys,* Vol. 7, Aug. 1936, p. MA 408R/4. WB (7b)

Influence of Welding Methods on the Mechanical Properties of the Welds. YVES MERCIER. *Welding Ind., London,* Vol. 4, June 1936, pp. 175-179. Discusses oxy-acetylene melting. WB (7b)

Arc Welding Sets and Electrical Supply for Shipyards. T. E. BERRY NIXON. *Welding Ind., London,* Vol. 4, Mar. 1936, pp. 51-54. WB (7b)

Welded Commercial Bodywork. A. J. NEUMANN. *Automobile Eng.,* Vol. 26, Nov. 1936, pp. 493-494. Notes on European methods in design and construction of welded parts, and welding procedures in general. Ha (7b)

International Association for Bridge and Structural Engineering. Berlin-Munich 1936 Congress. A. RAMSAY MOON. *Welding Ind., London,* Vol. 4, Jan. 1937, pp. 448-449. Brief review of welding subjects at conference. WB (7b)

Notes on the Training of Oxy-acetylene Welders. F. CLARK. *Welding Ind., London,* Vol. 4, Nov. 1936, pp. 366-368; Dec. 1936, pp. 413-417. Informative review with details of instruction required for training. WB (7b)

Welding Non-magnetic Steels to Mild Steels. J. H. CHILD. *Welding Ind., London,* Vol. 4, Apr. 1936, pp. 94-95. WB (7b)

Stainless Steels. H. HULL (Brown, Bayley's Steel Works, Ltd.) *Welding Ind., London,* Vol. 4, Feb. 1936, pp. 20-23. General survey. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 466R/7. WB (7b)

Welding Aluminum Bronze. M. A. BOUTTE. *Mech. World & Eng. Rec.,* Vol. 100, July 17, 1936, p. 50. Extended abstract. See *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 590L/10. WH (7b)

Deformeter Analysis of a Welded Rigid-Arch Building. LEROY A. BENFOY. *Welder,* Vol. 8, Aug. 1936, pp. 1033-1040. WB (7b)

Welding Technique Promotes Prevention of Corrosion (Schweisstechnik fördert die Korrosionsverhütung) ADRIAN. *Autogene Metallbearbeit.,* Vol. 30, Jan. 15, 1937, pp. 22-25. Welded structures include fewer inaccessible points that cannot be properly painted and that therefore initiate corrosion. Ha (7b)

Effect of Welding on the Scantlings of Ships and other Problems. A. G. AKESTER. *Welding Ind., London,* Vol. 4, Apr. 1936, pp. 109-116. WB (7b)

Welded Design for Six-span Continuous Girder Bridge. D. B. ARMSTRONG. *Eng. News-Record,* Vol. 118, Jan. 14, 1937, pp. 52-54. Girders are continuous all-welded construction over six 107-ft. spans. Floorbeams are made continuous through the girders. CBJ (7b)

Stack Flame Cutting of Freight Car Parts. B. F. ORR. *Iron Age,* Vol. 139, Feb. 11, 1937, pp. 48-51. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 89R/9. VSP (7b)

Cut Metal with Oxygen Lance. *Foundry,* Vol. 64, Nov. 1936, pp. 51, 54. **The Oxygen Lance.** *Mech. World Eng. Record,* Vol. 100, Aug. 21, 1936, pp. 171-172. *Blast Furnace Steel Plant,* Vol. 24, Sept. 1936, pp. 796-799. See *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 590L/6. VSP + WH + MS (7b)

Possibilities for Economy through Acetylene Welding in Metal Working Plants (Spermöglichkeiten in metallverarbeitenden Betrieben und Werkstätten durch Azetylenschweissung). J. J. THIESEN. *Autogene Metallbearbeit.,* Vol. 30, Feb. 15, 1937, pp. 55-59. Examples of use of scrap in fabricating small structures by oxy-acetylene welding are given. Ha (7b)

New Terms for Left-hand and Right-hand Welding and for Progressive and Retrogressive Welding (Neue Bezeichnung für Linkschweissung und Rechtsschweissung sowie für Vorwärtsschweissung und Rückwärtsschweissung). J. J. THIESEN. *Autogene Metallbearbeit.,* Vol. 30, Feb. 1, 1937, pp. 37-38. Suggests the more accurate terms "welding with torch between rod and melt" and "welding with burner before rod and melt" in place of the formerly used terms. Ha (7b)

Bridge Welding—A Review of the Literature. Part V. F. H. FRANKLAND. *Welder,* Vol. 8, Sept. 1936, pp. 1083-1084. See also *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 92L/10. WB (7b)

8. FINISHING

H. S. RAWDON, SECTION EDITOR

Metal Finishing. *Steel,* Vol. 100, Jan. 4, 1937, pp. 296, 299, 301, 414-418. Gives opinions of various authorities on developments in the metal finishing industry during 1936. MS (8)

Cleaning and Finishing Buick Automotive Parts. J. B. NEALEY (Am. Gas Asso.) *Ind. Finishing,* Vol. 12, Nov. 1936, pp. 20, 22, 24. Automobile parts at the Flint plant of Buick Motor Co. that are to be sprayed with lacquer are first bonderized (essentially a phosphate treatment) and dried in gas ovens. A substitute process recently introduced known as "chromodine" is designed for parts subjected to bending after japanning. VSP (8)

8a. Pickling

Safe and Dangerous Inhibitors. ULICK R. EVANS. *Iron Age,* Vol. 137, Apr. 30, 1936, p. 44. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 174R/2. VSP (8a)

Inhibited Pickling Baths for Ferrous Components. P. MABB. *Blast Furnace Steel Plant,* Vol. 24, Aug. 1936, pp. 690-692. See *Metals & Alloys,* Vol. 7, Dec. 1936, p. MA 592L/6. MS (8a)

Use of Inhibitors in the Selective Removal of Metallic Coatings and Rust. S. G. CLARKE. *Iron Age,* Vol. 137, Apr. 30, 1936, pp. 43-44. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 160R/1. VSP (8a)

8b. Cleaning including Sand Blasting

Chemical Coloring of Metals (Chemische Färbung der Metalle) H. KRAUSE (Forsch. Inst. Edelmetalle) *Z. Ver. deut. Ing.,* Vol. 81, Jan. 30, 1937, pp. 127-131. Review of coloring methods used for Fe, Zn, light metals, Cu and Cu alloys. 18 references. See *Metals and Alloys,* Vol. 7, May 1936, p. MA 248L/1. Ha (8b)

Cleaning Castings. P. W. PEEL. *Engr. of India,* Vol. 4, June 1936, pp. 55-57. Practical. Various British methods of cleaning castings, particularly the sand blast process are described, with notes on the dust menace. APS (8b)

Cleaning and Priming Galvanized-iron and Zinc-coated Metals. GEO. A. ENDOM. *Ind. Finishing,* Vol. 12, Oct. 1936, pp. 14-16. Practical review of the troublesome factors that must be eliminated prior to applying any enamel finish. Discusses importance of cleaning and drying and advises parts be primed as quickly thereafter as possible. Recommends Fe_2O_3 or $ZnCrO_4.7H_2O$ as primer; and for a finish coat, suggests any synthetic enamel, or as a second choice, an oil-base enamel. Lacquer enamels seem too brittle for Zn coated metals. VSP (8b)

8c. Polishing & Grinding

Precision Cylindrical Grinding. A. D. MEALS. *S. A. E. Journal,* Vol. 40, Jan. 1937, pp. 1-10. Practical discussion of centertype and centerless grinding operations, requirements as to machine rigidity, grain and grade of grinding wheels. Various types of machines are illustrated for different production jobs. Charts and curves are given relating production speed to degree of finish and diameter of work for both types of grinding. WB (8c)

Precision Operations Used in Making Large Roller Bearings. FRED B. JACOBS. *Steel,* Vol. 100, Jan. 11, 1937, pp. 34-36. Illustrated description of methods used by Rollway Bearing Co., Inc., Syracuse, N. Y., with chief attention to grinding procedure. MS (8c)

Utility Supersedes Appearance as Reason for Applying High Finish to Ax Blades. *Steel,* Vol. 100, Feb. 1, 1937, pp. 60, 62. Practical description of grinding, heat treating, and polishing methods, as used by Warren Axe & Tool Co., Warren, Pa. MS (8c)

8d. Electroplating

Electrolytic Coatings on Aluminum and Aluminum Alloys (Galvanische Uberzüge auf Aluminium und Aluminium-Legierungen) KARL ALTMANNSBERGER. *Metallwirtschaft,* Vol. 16, Feb. 12, 1937, pp. 161-162. Descriptive—no bibliography. GA (8d)

Superficial Attack of the Metal Base before Electrodeposition (L'Attaco Superficiale der Metallo-Base prima della Elettrodeposizione) V. P. SACCHI. *Ind. Meccan.,* Vol. 18, Dec. 1936, pp. 757-762; Vol. 19, Jan. 1937, pp. 17-21. Review plus original research. The customary chemical or electrolytic pretreatment of surfaces to be electroplated is believed to aid adhesion not so much through the many cavities so produced but by removal of the amorphous surface film in the presence of which no deposit is possible. Structural characteristics of the transition zone are described at length with micrographs. See *Metals and Alloys,* Vol. 5, Dec. 1934, p. MA 572R/5. Ha (8d)

The pH Control of Electroplating Baths. W. R. KENNY & A. B. REED. *Metal Cleaning Finishing,* Vol. 7, Sept. 1935, pp. 453-454. Practical. Emphasizes the fact that pH value of a plating solution determined by the electrometric method is about .5 pH unit lower than corresponding value found by colorimetric comparator with Brom Cresol Purple (pH range 5.2-6.8) or Brom Cresol Green (3.8-5.4). To avoid confusion it is recommended that reports on pH values state method used. In plating, colorimetric method is generally employed. GBH (8d)

Application of Electrolytic Polishing in the Study of Metallic Deposits (Application du Polissage Électrolytique à l'Étude des Dépôts Métalliques) PIERRE JACQUET. *Comptes Rend.,* Vol. 204, Jan. 18, 1937, pp. 172-174. Experimental work with discussion. Author refers to earlier paper describing an electrolytic method of polishing the cathode (see Bull. Soc. Chimique de France, 3, 1936, p. 705) which does not distort the surface. Electron diffraction studies showed the first areas of metal deposited on the cathode to be influenced by grain boundaries, crystallographic planes and dendrites in the cathode structure. FHC (8d)

Heavy Machine Parts Built Up by Nickel Plating. G. F. GEIGER. *Steel,* Vol. 100, Feb. 15, 1936, pp. 58, 60. Practical. Describes "Fescol" process for building up worn or undersized metal parts, particularly steel. The cleaned part is dipped in molten wax, which is then removed from area to be built up. Exposed area is cleaned electrolytically, rinsed, and Ni plated at 80° F. in a still tank to a thickness of ½ in., if necessary. After removal of wax, built-up area is machined or ground to size. Hardness may be varied up to 60 scleroscope. Wear-resistance is high. Such reclaimed parts have been used at 900° F. MS (8d)

Tin Plating Aluminum Alloy Pistons. DALE BROWN, V. SHULNBURG & G. DELL. *Automotive Ind.,* Vol. 75, Dec. 26, 1936, pp. 884-886. Practical. Tin plating of Al alloy pistons by immersion in sodium stannate solution is described. The process includes: (1) 3 sec. dip in 6 oz./gal. Magnus cleaner at 175°-185° F., (2) cold water rinse, (3) 1 sec. etch in 20% nitric acid at room temperature, (4) repeat step 2, (5) 3-5 min. in 6 oz./gal. sodium stannate plating bath at 175°-180° F., (6) repeat step 2, (7) hot water rinse. Excessively high temperatures of cleaning or plating baths cause blisters. Free alkali in the plating bath must be neutralized for the same reason. CMH (8d)

Bright Nickel-plating (Glanzvernicklung) R. SPRINGER. *Oberflachentech.,* Vol. 14, Mar. 2, 1937, pp. 49-51. Up-to-date foreign review. The conditions essential to the production of brilliant Ni deposits are discussed. Crystal grains of the deposits should be so oriented that one of the reflecting surfaces lies in the plane of the surface of the object, and the crystal grain must be smaller than the shortest light wave length. The preparation of the pieces, methods of degreasing and composition of baths are discussed. Bright Ni plating baths of recent development contain usually complex aromatic sulfonic acids, and operate at a current density of 1-2 amp./dm.^{2} in commercial, and 6-8 amp./dm.^{2} in laboratory baths; temperature is 20-22° C and pH 5.6-5.8. The elimination of subsequent polishing means a saving in raw material. Ha (8d)

8e. Metallic Coatings other than Electroplating

Notes on Fluxes for Hot Galvanizing. A. T. BALDWIN. *Steel,* Vol. 99, Aug. 17, 1936, pages 49-50, 52; Aug. 24, 1936, pages 48-49, 51. Discusses and compares various chemical compounds, and recommends replacement of HCl-NH_4Cl method by a mixture of $ZnCl_2$ and NH_4Cl for both flux wash and kettle flux for production of smooth, adherent, ductile Zn coats. A mixture in the following proportions, 1 $ZnCl_2$ to $3NH_4Cl$, is preferable. MS (8e)

Cementation of Tungsten on Some Metals. TSUTOMU KASE. *Kinzoku no Kenkyu,* Vol. 14, Jan. 1937, pp. 22-34. In Japanese. Original Research. With powdered W (98.84% W, 0.25% Fe, and 0.08% C) the cementation of Fe, Ni, and Cu at various temperatures between 800° and 1350° C. for 1 to 5 hrs. was studied. The surface layer of the cemented specimens was investigated as to depth of penetration, microstructure, chemical composition and corrosion by certain acids. W diffuses into the foregoing metals at temperatures lower than 800°, and the rate of diffusion increases with rise of temperature. The relation between the weight increase of the specimen or the depth of penetration and the absolute temperature of cementation or the time required for the treatment is given by an exponential function (see *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 595L/4). The cemented surfaces are harder than the original material. Although the Ni cemented with tungsten resists HCl, others are of little advantage in this respect. KT (8e)

Cementation of Molybdenum on Some Metals. TSUTOMU KASE. *Kinzoku no Kenkyu,* Vol. 14, Feb. 1937, pp. 75-86. In Japanese. Original Research. With pulverized ferromolybdenum (74.68% Mo, 0.11% C) the cementation of Fe and Ni at various temperatures between 800° and 1300° C. for 1 to 5 hrs. was studied. The surface layer of the cemented specimens was investigated as to depth of penetration, microstructure, chemical composition and corrosion by certain acids. The addition of ammonium chloride to the diffusion mixture was without effect on the diffusion of Mo into Fe. Below the A_3 point, Mo does not perceptibly diffuse into Fe, but above this temperature diffusion is clearly recognizable and becomes appreciable as the temperature approaches 1300° C. The diffusion of Mo in Ni proceeds below 800°, and the rate of diffusion increases with rise of temperature. The relation between the weight increase of the specimen or the depth of penetration and the absolute temperature of cementation or the time required is an exponential function, previously reported (*Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 595L/4). The cemented surfaces are harder than the original material. Although the nickel cemented with Mo resists HCl, the others were of negligible merit in this respect. KT (8e)

Effect of Hot-galvanizing on the Repeated Bends and Uniformity of Tensile Properties of Drawn Steel Wire (Einfluss des Feuerverzinkens auf die Biegewechselfestigkeit und die Gleichmässigkeit der Festigkeitseigenschaften gezogener Stahldrähte) F. GREIS & H. RUPPIK. *Arch. Eisenhüttenw.,* Vol. 10, Aug. 1936, pp. 69-71. Original Research. Cable wires of 0.5-0.8% C were drawn to 2.7 mm. diam. to tensile strength of 200,000-240,000 lbs./in.^{2} and the effect of galvanizing and water-quenching from the galvanizing both studied. The resistance to repeated bending decreased upon galvanizing, but was restored on holding in the bath to get a tempering effect and on subsequent water-quenching. The detrimental effect of galvanizing is ascribed to the formation of a brittle Fe-Zn layer and the roughening of the surface by pickling. SE (8e)

Wired Radio Controls Galvanizing Process. E. M. BRYDON & A. M. TRAGNER. *Elec. World,* Vol. 107, Jan. 30, 1937, pp. 42-43, 92. Practical. Off-peak operation is automatically governed on substation feeder by wired radio device. Zn bath temperature is controlled by potentiometer recorder and controller. CBJ (8e)

Babbitt Is Applied bv Spray Method. *Steel,* Vol. 99, July 27, 1936, p. 45. From *Metallizer,* Vol. 5, Apr.-May 1936, p. 6. See *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 539L/2. MS (8e)

Porosity in the Tin Coating of Tin-plate. A. W. HOTHERSALL & J. C. PRYTHERCH. *Blast Furnace Steel Plant,,* Vol. 24, Sept. 1936, pp. 791-795, 820-821. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 455L/5. MS (8e)

Hot Tinning Difficulties Avoided by Adherence to Good Shop Practice. J. R. SWANTON. *Steel,* Vol. 99, July 27, 1936, pp. 40, 42. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 95L/6. MS (8e)

8f. Non-Metallic Coatings

The Effectiveness of Amines as Preventive Against the Attack of Pure Aluminum in Acids (Ueber die Wirkung von Aminen als Schutzstoffe bei der Auflösung von Reinaluminium in Säuren) W. GELLER (Materialprüfungsanst. Verein. Al-Werke A.G.) *Z. Metallkunde,* Vol. 28, Nov. 1936, pp. 354-356. Original research. The solution rates of half-hardened 99.5% Al were observed at 20 and 50° C. in 10% H_2SO_4 and 5% HCl solutions with and without additions of aliphatic amines. Unlike Fe, no protective effect was observed in the H_2SO_4 solutions. However in HCl solutions a temporary protection was found, roughly proportional to the N concentration and the length of the hydrocarbon chain. The protection diminished with increasing time and temperature. GD (8f)

Baking Enamels on Sheet Metal and Castings. GEORGE McDOUGALL. *Ind. Finishing,* Vol. 13, Dec. 1936, pp. 48, 50, 52, 54, 56. Practical. Cleaning methods for sheet metal before enameling vary with kind of metal and its condition. Baking period for enamel varies from 30 min. to 3 hr., and, starting from a cold oven, the temperature varies from 150° to 400° F. For vitreous enamels the temperature runs as high as 1500° F. In jobs of 2 or more coats, the first coat is usually a solid opaque sheen; the second has more gloss; and the third has a high gloss. The use of synthetic enamels is recommended. The decoration on baked and synthetic enamels is discussed and an example of enameling on cast Fe fittings given. VSP (8f)

Measurement and Significance of Enamel Thickness. H. H. HOLSCHER. *J. Amer. Ceram. Soc.,* Vol. 19, Oct. 1936, pp. 298-303; *Enamelist,* Vol. 14, Nov. 1936, pp. 9-17. Original research. Tendency of enamel to chip increases directly with thickness of the coating. Rejected samples sent back to enameler tend to build up thicker enamel coat and it is proposed to limit such reprocessing to 2 coats. Thickness of an enamel coating can be determined without destruction of enamel by means of newly developed electromagnetic thickness gage of General Electric Co. This device and method of using it are described. Graphs are given of impact, torsion chipping, chipping, etc., versus enamel thickness. Some plant production and consumer chipping figures are given in tables. WB (8f)

Chemical Oxidation of Aluminum Foil by the MBV-process (Die chemische Oxydation von Aluminium folie nach dem MBV-Verfahren) H. NEUNZIG. *Aluminium,* Vol. 19, Jan. 1937, pp. 2-3. Review, plus original research. Oxidation of Al by sodium-chromate solution (MBV-process) is discussed and an investigation of the thickness of the oxide layer and the minimum suitable thickness of the foil is described. The lower limit was found to be 0.03 mm. foil for which the immersion time limit was 1 min. If the foil was exposed for a longer time to the solution it became perforated. Foil of 0.05 mm. could be immersed for 10 min., without injury. The oxide layer offered good protection against corrosion from NaCl solution and steam. **MBV-treatment and Lacquering of Aluminum Coils (Ueber die MBV-Behandlung und Lackimpregnation von Aluminium-Rohrschlangen).** *Ibid,* pp. 20-22. Practical. If Al tubes are to be treated on the inside the MBV (sodium chromate) solution must be applied hot at 95°-100° C. and passed through the tube under pressure. In order to obtain a uniform layer of lacquer, preheated air should be sent through the tube after lacquering. Ha (8f)

Delayed Ground-coat Blistering. G. H. SPENCER-STRONG & JAMES J. THEODORE. *J. Am. Ceram. Soc.,* Vol. 19, Nov. 1936, pages 328-330. Practical investigation of blistering of enamel coatings with respect to conditions responsible for same in pickling, blast cleaning, Cu flash, cleaner additions, neutralizers, etc. Results indicate that Cu flash does not cause blisters but will aggravate the defect when caused by other conditions. Blistering of test plates was also attributed to (a) steel grit used in blast cleaning carried fine dust along with it, (b) deposition on pickled plate of asphaltic tank liner compound, (c) rosin in cleaning solution or deposition of insoluble Ca soaps from hard waters. WB (8f)

Reconditioned Machines Refinished to Insure Attractive Appearance. *Steel,* Vol. 99, Nov. 23, 1936, pages 48, 52, 72. Describes cleaning and finishing operations, particularly for machine tools to be stored after reconditioning. MS (8f)

New Developments in Metal Finishes Speed Automobile Production. J. B. NEALEY. *Steel,* Vol. 99, Oct. 26, 1936, pages 60-61. Same as *Industrial Heating,* Vol. 3, Dec. 1936, pages 853-857. MS (8f)

9. TESTING

Temperature Measurements with the Disappearing-filament Optical Pyrometer. W. E. FORSYTHE. *Trans. Am. Inst. Mining Met. Engrs., Iron & Steel Division,* Vol. 120, 1936, pp. 171-188; discussion pages 202-216. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 162R/2. JLG (9)

A Simple Arrangement for the Measurement of Thermal and Electrical Conductivity (Eine einfache Anordnung zur Messung der Wärme- und elektrischen Leitfähigkeit) F. FÖRSTER (Kaiser Wilhelm Inst. Metallf., Stuttgart) *Z. Metallkunde,* Vol. 28, Nov. 1936, pp. 337-340. Descriptive. The thermal conductivity of an unknown sample is compared with that of a known sample by the use of one millivoltmeter. Specimens 7 cm. long by 1 cm. diam. are large enough and a temperature gradient of only 6° C. is required. An entire measurement can be made in 15 min. with an error of about 1%. The electrical conductivity of the same sample can be determined simultaneously. It is shown that the thermal conductivity of a 0.8 C steel, quenched and annealed at 680° C. remains constant while the electrical conductivity increases with time. GD (9)

The Examination of Colliery Wire Ropes in Service. M. A. HOGAN. *Iron & Coal Trades Rev.,* Vol. 134, Feb. 26, 1937, pp. 393-395. A report of 56 ropes investigated by the Rope Research Committee (British) is discussed with regard to causes of deterioration, detection of faults, and methods of testing while in service. Ropes used in mines to haul men are considered in particular. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 470R/3. Ha (9)

Optical Tests for the Metal Industry. R. PRUNSCH. *Iron & Steel Can.,* Vol. 19, Dec. 1936, pp. 5-13. Principles of testing by magnifying glass, illumination, microscope, spectrographic methods, apparatus and equipment, and evaluation of results are described. Ha (9)

9a. Inspection & Defects, including X-Ray Inspection

C. S. BARRETT, SECTION EDITOR

Proper Conditions for Radiography (Zweckmässige Aufnahmebedingungen bei der Röntgendurchstrahlung) E. A. W. MÜLLER. *Arch. Eisenhüttenw.,* Vol. 10, Dec. 1936, pp. 267-273. The size of voids and inclusions detectable by radiography was studied by making exposures of specimens with artificial holes, various thickness of wires, and of sheets. Improvements in detail and contact with various films and fluorescent coatings are discussed. SE (9a)

Hollow Anode Tube for Radiography (Hohlanodenröhre für die Rontgendurchstrahlung) E. A. W. MÜLLER. *Arch. Eisenhüttenw.,* Vol. 10, Apr. 1937, pp. 481-483. An X-ray tube with a hollow anode consisting of a small diameter tube which can be inserted in hollow vessels and other bodies for X-ray examination of the walls, welds, etc., is described. SE (9a)

The Electrolytic Determination of Non-metallic Inclusions in Iron and Steel (Die elektrolytische Bestimmung von nichtmetallischen Einschlüssen in Eisen und Stahl). K. H. KIPPE & O. MEYER. *Arch. Eisenhüttenw.,* Vol. 10, Sept. 1936, pp. 93-100. The method of F. W. Scott with magnesium iodide electrolyte resulted in contamination of FeO containing inclusions with iron hydroxide. The sodium bromide-sodium citrate electrolyte of Treje and Benedicks was preferred. Lower O_2 values were obtained in vacuum fusion analyses than in electrolytic extractions. For Al_2O_3 and SiO_2 inclusions good agreement was obtained between electrolytic and dilute HCl extractions. SE (9a)

On Laminations and Banding in Saw Blades (Ueber die bei Sägeblättern häufig auftretende Schieferung) W. EILENDER, A. WALZ & O. MEYER. *Arch. Eisenhüttenw.,* Vol. 9, June 1936, pp. 601-605. Original research. Metallographic studies of forged and rolled eutectoid C steel wood-saw blades, melted in various ways and variously heat-treated indicated that the cause of lamination and banding is dendritic and crystalline segregation, principally of inclusions. This cannot be entirely avoided but it can be mitigated by conditions which give smaller dendrites, by higher melting temperature, slower solidification, and repeated changes in hot working direction. SE (9a)

Tension and Notched Bar Tests on an Alloy Steel. J. MUIR. *J. Roy. Tech. Coll., Glasgow,* Vol. 4, Part I, Jan., 1937, pp. 1-11. Original research. The results of ordinary tensile, Brinell hardness, and notched-bar bend tests made with a Houndsfield Tensometer after treatment (1) by annealing at 700°, 800°, 900° and 1000° C.; (2) by rapid cooling from 900° C. in an air blast, in oil and in water; (3) by tempering samples which had been oil-hardened from 900° C. by heating to 500°-750° C. and allowing to cool in air on a Ni-Mo alloy crank web, which had failed in service, are given. Special experiments were made to measure yield point strains and it is suggested that the heat treatment that left the material in the condition giving greatest yield point strain and stress was probably the most suitable, and that the usual specification of heat treatment, "oil harden, temper and water-quench" might be replaced by air harden, temper, and air cool. See also *Metals and Alloys,* Vol. 7, July 1936, p. MA 346L/4. (The suggested treatment, on the basis of the results obtained, might be adopted with advantage. J.W.D.) JWD (9a)

Gage Blocks, their Measurement, their Precision (Les Cales à Bouts Plans, leur Mésure, leur Précision) M. P. SALMON. *Mém. Artillerie Francaise,* Vol. 15, No. 1, 1936, pp. 173-263. Detailed review, plus original research. Discusses blocks made in America, England, and on the continent, including experiments with Werner, Zeiss, and Johansson gage blocks. Chemical compositions of various blocks were: 0.4-1.4% C; 0.12-0.28% Si; 0.20-0.42% Mn; 0.017-0.031% P; 0.018-0.054% S, 0-2.25% Cr; 0-0.35% Ni. Heat treatments included normalizing, quenching and aging. Aging treatment necessary to fix dimensions requires 2½ yrs. at room temperature, or 500 hours at 150° C. A large part of the paper is devoted to the determination of the dimensions of gage blocks by light interference methods. Interferometers of Kösters and of Pérard were used. Experiments to determine the errors of measurement inherent in the use of gage blocks are attributed to (1) errors in measurement of the blocks themselves, (2) errors due to variations in empirical laws for correction for expansion and contraction due to temperature changes, (3) errors caused by thin films of oil between blocks. These errors are all in the order of a small fraction to two or three microns. DJM (9a)

Testing of Materials Used in Shipbuilding with Modern Microscopes (Die Werkstoffprüfung in der Schiffbautechnik mit Hilfe der neuzeitlichen Mikroskope) A. KARSTEN. *Schiffbau, Schiffahrt & Hafenbau,* Vol. 38, Mar. 15, 1937, pp. 96-99. Recent German models of microscopes, mainly the Metaphot and Citaphot of E. Busch-Rathenow, and application to the study of Cd bearing alloys, coated wire, Cr-Ni steel and non-ferrous materials are described. EF (9a)

9b. Physical & Mechanical Testing

W. A. TUCKER, SECTION EDITOR

On the Impact Phenomena. ZIRÔ TUZI & MASATAKA NISIDA *Bulletin of the Institute of Physical & Chemical Research, Tokyo,* Vol. 15, Sept. 1936, pages 905-922. In Japanese. *Scientific Papers & Abstracts of the Institute of Physical & Chemical Research, Tokyo,* Vol. 30, Sept. 1936, page 49. In English. Impact phenomena have been studied with a high speed camera having an analysing power of 1/80,000 sec. Beams supported at both ends were struck at centre with falling masses of various weights and at varying velocities. In disagreement with the classical theory, several collisions were observed during "a single impact." Steel, Cu, Al hardened steel, and some organic materials were used as samples. The manner of contact seems to depend on the ratio of the weight of the beam and the falling mass, and is independent of the beam and the impact velocities. WH (9b)

Residual Stresses in Rails (Eigenspannungen in Eisenbahnschienen) HERMANN MEIER. *Organ für die Fortschritte des Eisenbahnwesens,* Vol. 91, Aug. 1, 1936, pages 320-329. A testing method for the determination of internal stresses in rails is described. The internal stresses are grouped as cooling stresses and stresses set up by straightening processes. The latter are fully considered. The internal stresses of some special rails including compound rails are given. The stress distributions in a typical rail during summer and winter are graphically shown. Concludes with a critical discussion of the effect of internal stresses upon life of rails. WH (9b)

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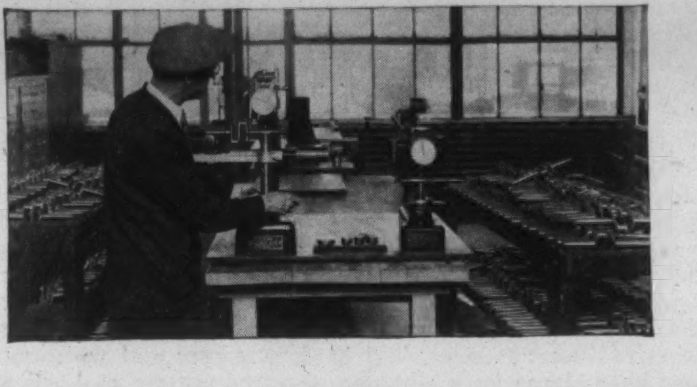

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9c. Fatigue Testing

H. F. MOORE, SECTION EDITOR

The abstracts appearing under this heading are prepared in co-operation with the A.S.T.M. Research Committee on Fatigue of Metals. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

Wire-rope Problems. B. P. HAIGH. *Proceedings South Wales Inst. of Engineers,* Vol. 52, No. 5, 1937, pp. 325-358. Summary of history and present state of knowledge concerning strength of wire rope is given. Fatigue problems are given especial attention. Fatigue failures are common, especially on account of stresses caused by wires passing round sheaves. Repeated stress does not reduce ductility of wire unless a fatigue crack is started, and then only in vicinity of crack. Fatigue testing machines and methods described in detail, especially the Haigh-Robertson reversed flexure machine which rotates a specimen of wire about its own axis when bent in a sine curve by end compression. In any wire rope installation the diameter of sheave used is a major factor in determining fatigue strength. The effect of surface conditions and of a decarburized surface layer is marked as shown by following table.

Ratio of Endurance Limit to Static Tensile Strength

	Wire with decarburized surface layer 280,000 lb./in.^{2} tensile strength	Wire without decarburized surface layer 292,000 lb./in.^{2} tensile strength
As drawn	0.185	0.243
Machine-polished	0.224	0.286
Polished 000 emery	0.234	0.306

In general fatigue strength is raised, but to a less degree than tensile strength, by repeated reduction through dies up to a certain limit. Above that limit "overdrawing" reduces fatigue strength. Surface conditions and lubrication of dies are fields needing further study. Corrosion-fatigue reduces fatigue strength of wire very greatly. Oil and grease reduce effect of corrosion-fatigue somewhat. Galvanizing properly done increases resistance to corrosion-fatigue. Under non-corrosive conditions galvanized wire has considerably less endurance under repeated stress than ungalvanized under high stress and short life, but under low stress and millions of cycles of stress it is nearly as strong as ungalvanized, and resists corrosion fatigue better. Test data substantiating this conclusion are given. In service wire rope does not develop the endurance shown by tests in the Haigh-Robertson machine, probably due in part to the added direct tensile stress in service. Ropes with a small number of comparatively large wires seem to come nearer to endurance shown by laboratory tests than ropes with many small wires. The design of nonmetallic yielding cores for wire ropes and of the shape of sheave rims are fields needing study. A detailed discussion of stress-intensifying factors in wires in service is given. Different "lays" used in wire ropes seem to have only a minor effect on fatigue strength. HFM (9c)

Fatigue Diagrams of Notched and Cold-deformed Steels and of 1-in. and 1$\frac{1}{8}$-in. Screws at Different Mean Tensile Stresses (Dauerfestigkeitsschaubilder von gekerbten und kaltverformten Stählen sowie von 1" und 1$\frac{1}{8}$" Schrauben bei verschiedenen Zugmittelsspannungen) A. POMP & M. HEMPEL. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf,* Vol. 18, No. 14, 1936, pp. 205-215. A 60-ton repeated-stress testing machine of the pulsator type, with adjustable range of applied stress is described in detail, and the manner of taking load diagrams, and the results of fatigue tests made with the machine are discussed at length For 1-in. and 1$\frac{1}{8}$-in. screws of two different grades of steel the range of fatigue strength was found to be the mean tensile stress applied during a cycle plus or minus 4300-5700 lbs./in.^{2} The tests were made with mean tensile stresses up to about two-thirds of the static tensile strength. (Note by HFM: For a range of stress from zero to a maximum the Pomp-Hempel results give effective stress concentration factors not widely different from those found by Moore and Henwood for $\frac{3}{8}$-in. threads, **Bull. 264,** Univ. of Ill. Eng. Exp. Sta.). See *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 540R/9. Ha + HFM (9c)

Vibration of Crankshaft-propeller Systems. KARL LURENBAUM. *S. A. E. Journal,* Vol. 39, Dec. 1936, pp. 469-479. Critical discussion of crankshaft failures indicates longitudinal vibration responsible. Methods of test and mathematical treatment of freedom and vibration problems are presented. Most promising cure is to displace resonance points to fields outside of the operating range. WB (9c)

Fatigue Strength of Pinion Shafts (Dauerhaltbarkeit von Ritzelwellen) ERNST LEHR. *Z. Ver. Deut. Ing.*, Vol. 81, Jan. 30, 1937, pp. 117-118. Original research on the comparative fatigue strength under reversed flexure of pinion shafts in which the pinion teeth are cut in the shaft with no reduction of shaft at the inner end of the pinion teeth (the spaces milled between teeth have what in the U. S. are called "sled runner" ends), and pinion shafts in which there is a circumferential groove cut inside the pinion teeth reducing the diameter of the shaft to that at the root of the teeth. Detailed results of tests on several pinion shafts are given. The pinion shafts without reduction of diameter at the inside edges of the pinion teeth showed fatigue strength about 45% greater than the pinion shafts with such groove. The weakening effect of notches or scratches was also observed.
Ha + HFM (9c)

Machines for Locating Endurance Limit (Prüfmaschinen zur Ermittlung der Dauerfestigkeit) H. OSCHATZ. *Z. Ver. deut. Ing.*, Vol. 80, Nov. 28, 1936, pp. 1433-1439. Survey of equipment and technique. 29 references.
Ha (9c)

Failure of Heat-treated Steel Wire in Cables of the Mt. Hope, R. I., Suspension Bridge. W. H. SWANGER & G. F. WOHLGEMUTH. *Proc. Am. Soc. Testing Materials*, Vol. 36, Pt. II, 1936, pp. 21-75; discussion pp. 76-84. **Failure of Heat-treated Cable Wire.** IDEM. *Heat Treating Forging*, Vol. 22, Aug. 1936, pp. 391-393. **Studies Mt. Hope Suspension Bridge Cable Wire.** IDEM. *Steel*, Vol. 99, July 27, 1936, pp. 57-58. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 109R/6.
VVK + MS (9c)

9d. Magnetic Testing

L. S. REID, SECTION EDITOR

Automatic Recording of Magnetization Curves (Selbsttätige Aufzeichnung von Magnetisierungskurven) W. STEINHAUS & E. SCHOEN. *Physik. Z.*, Vol. 38, Jan. 1, 1937, pp. 1-5. Describes in detail an apparatus which plots magnetization curves of all kinds of ferro-magnetic materials, from high-permeable to hardest permanent magnet steels. The evaluation of the photograms is explained.
EF (9d)

Definition of "Curie Point" (Zur Definition des "Curiepunktes") A. KUSSMANN & A. SCHULZE. *Physik. Z.*, Vol. 38, Jan. 15, 1937, pp. 42-47. Original research. Based on extensive tests (magnetization/temperature curves at very low densities in comparison with resistance/temperature curves) it is suggested that (a) the common practice of taking the peak of the temperature coefficient of the electrical resistance as the Curie point should be abandoned, (b) the Curie temperature in the ideal case of absolute homogeneity represents a sharply defined point and not a temperature range, (c) all observations to the contrary are due to variations of concentration in minute regions of the testing material.
EF (9d)

Magnetic Properties of Superconducting Metals and Alloys (Magnetische Eigenschaften supraleitender Metalle und Legierungen) L. W. SCHUBNIKOW, W. I. CHOTKEWITSCH, I. D. SCHEPELEW & I. N. RJABININ. *Physik Z. Sowjetunion*, Vol. 10, No. 2, 1936, pp. 165-192. In German. Extensive tests (21 diagrams) on magnetic induction in pure superconducting metals and alloys at different temperatures and external magnetic fields. The composition of the solid solution samples was also varied. See also *Metals and Alloys*, Vol. 6, Dec. 1935, p. MA 511R/8.
EF (9d)

The Propagation Velocity of Hysteresis (Die Ausbreitüngsgeschwindigkeit der Unmagnetisierung) F. D. MIROSCHNITSCHENKO (Moscow State University) *Physik. Z. Sowjetunion*, Vol. 10, No. 4, 1936, pp. 540-562. In German. Review plus original research. A new method was employed to determine the propagation velocity of hysteresis in stretched and twisted Ni-Fe samples (15% Ni, 85% Fe) in relation to the stresses applied. The derivations are in agreement with the formulas introduced by Sixtus & Tonks. See *Metals and Alloys*, Vol. 2, Aug. 1931, p. MA 145.
EF (9d)

9e. Spectrography

A New X-ray Spectrographic Method for Chemical Analysis of Polished Surfaces (En ny röntgenspektroskopisk Metod för kemisk Analys av slipade Ytar). L. VON HAMOS. *Tek. Tid.*, Vol. 67, Jan. 9, 1937 (Section *Bergsvetenskap*), pp. 1-4. See *Metals and Alloys*, Vol. 7, Dec. 1936, p. MA 598R/8.
BHS (9e)

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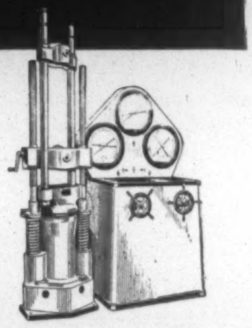

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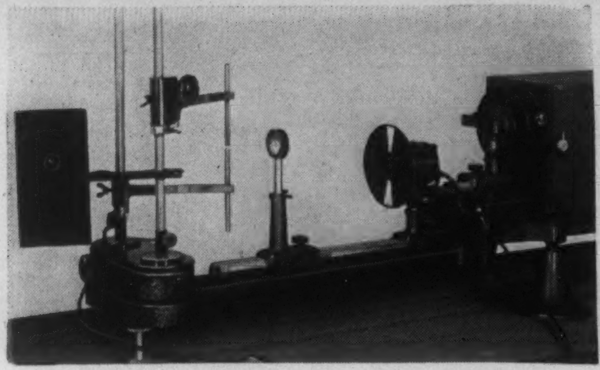

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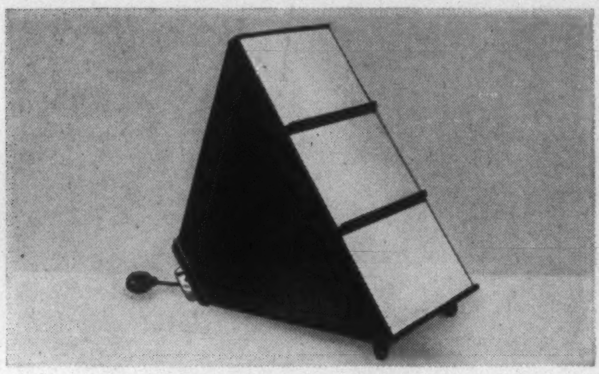

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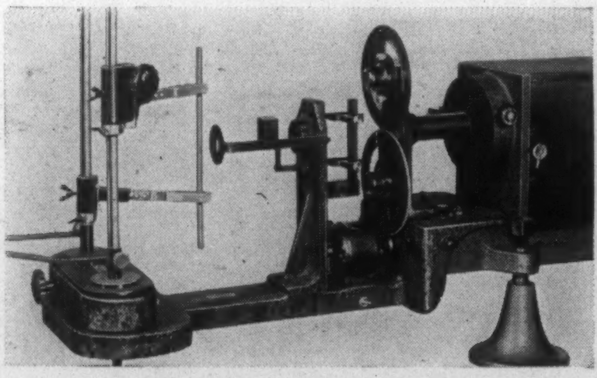

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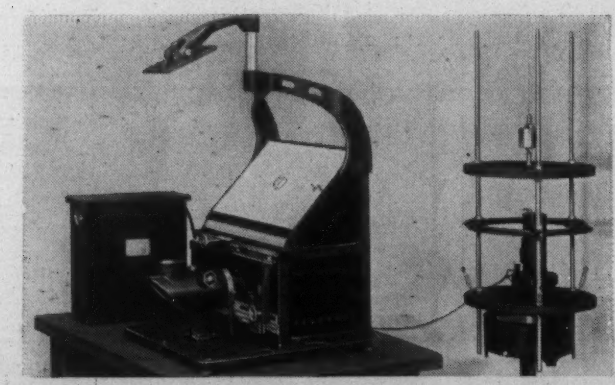

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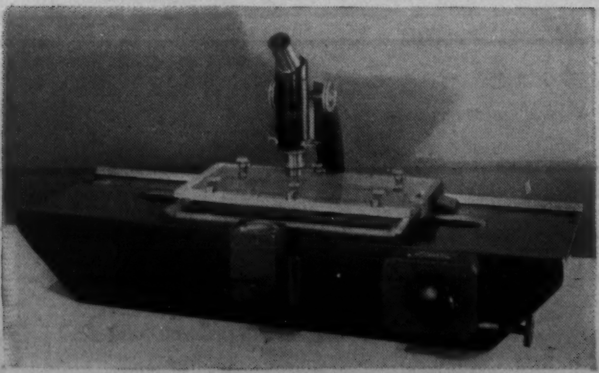


Spectrum Measuring Microscope

10. METALLOGRAPHY

J. S. MARSH, SECTION EDITOR

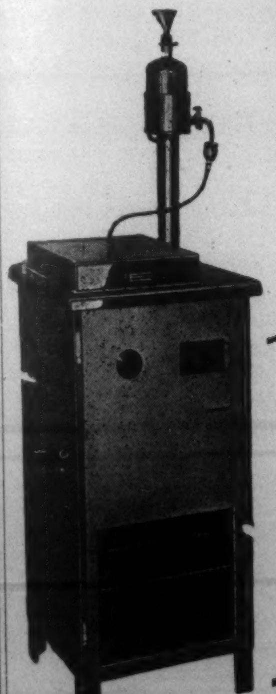
The Theory of Phase Transitions. L. LANDAU. *Nature,* Vol. 138, Nov. 14, 1936, p. 840. **(Zur Theorie der Phasenumwandlungen I)** IBID. *Physik. Z. Sowjetunion,* Vol. 11, Jan. 1937, pp. 26-47. A mathematical study of thermodynamic potential indicates there can be only two kinds of transition points (lines on the p-T diagram), namely, phase transition points and Curie points. Curie points are only possible when both modifications are different and the crystal symmetry of one is a certain sub-group of the symmetry of the other. In alloys this change of symmetry is usually a doubling of the lattice constant. In some cases instead of a Curie-point line on the p-T diagram there may be a continuous transition without a jump in the energy at a single point in the p-T diagram. No Curie-point line can exist for melting. CSB + EF (10)

Equilibrium Relations in Aluminum-magnesium-zinc Alloys of High Purity. WILLIAM L. FINK & L. A. WILLEY. *Metals Technology, American Institute Mining & Metallurgical Engineers, Technical Publication* No. 761, Dec. 1936, 32 pages. The Al corner of the Al-Mg-Zn diagram was determined, chiefly by electric-resistance measurements and microscopic examination of samples quenched from different temperatures. X-ray diffraction patterns were obtained for identification of phases in some alloys. Isothermal sections of the diagram at temperatures up to 440° C. are shown. 21 references. Continuation of previous work. See *Metals and Alloys,* Vol. 8, Jan. 1937, page MA 33L/6. JLG (10)

Micrography of Wrought Aluminium Alloys (Zur Mikrographie von Aluminium-Knetlegierungen) A. J. STELLJES. *Aluminium,* Vol. 18, Dec. 1936, pages 601-607. The microstructure changes in a specimen of light metal from ingot to finished sheet are illustrated and the development of Cu segregation followed. To obtain a fine cast structure the pouring temperature should be low, and the heat of solidification conducted away as quickly as possible, by low chill-mold temperature). Over-heating defects are illustrated. Ha (10)

On the Stability of Cementite. KONTARO HONDA, KEIZO IWASE & KOKITI SANO. *Science Reports of the Tohoku Imperial University,* Vol. 25, July 1936, pages 202-206. (In English). The solubility of graphite in austenite was calculated from the equilibrium constant of the system austenite $CO = CO_2$, at various temperatures. Comparing this result with the solubility of cementite it is concluded that above 940° C. cementite is more stable than graphite, below 940° C. graphite is the more stable. A slight modification of the Fe-C equilibrium diagram is suggested by introducing a dotted horizontal XY line at 940° C. to show the boundary line of the stability of cementite. BWG (10)

The Theory of Age-hardening. MARIE L. V. GAYLER (MRS. HAUGHTON). *Journal Institute of Metals,* Vol. 60, Jan. 1937, pages 55-72 (Advance Copy No. 762). A general theory of age hardening, based mainly on data on alloys of duralumin type, Be-Cu and Ag-Cu, is postulated. Age hardening takes place in 2 steps: (1) diffusion and (2) precipitation, the 2nd overlapping the 1st. Both processes take place within wide temperature limits that are peculiar to every alloy system. The rate at which each process takes place depends apart from other factors on the temperature of aging. Limits of temperature ranges at which the processes take place are indeterminate, but approximations can be obtained for all practical purposes. If the temperature of aging be close to the lower limit, both stages take place extremely slowly. If the temperature is near the upper limit the 1st stage takes place so rapidly that its effects will not be detected. Each of the processes is characterized by changes in physical properties which will present maxima or minima depending on the aging temperature. The softening that occurs when an alloy is aged at a higher temperature after having been aged at a lower temperature is explained in the light of the new theory. Curves are given representing relations between hardness and duration of aging, between maximum hardness and temperature of aging, and between time of attaining maximum hardness and temperature of aging. 20 references. JLG (10)



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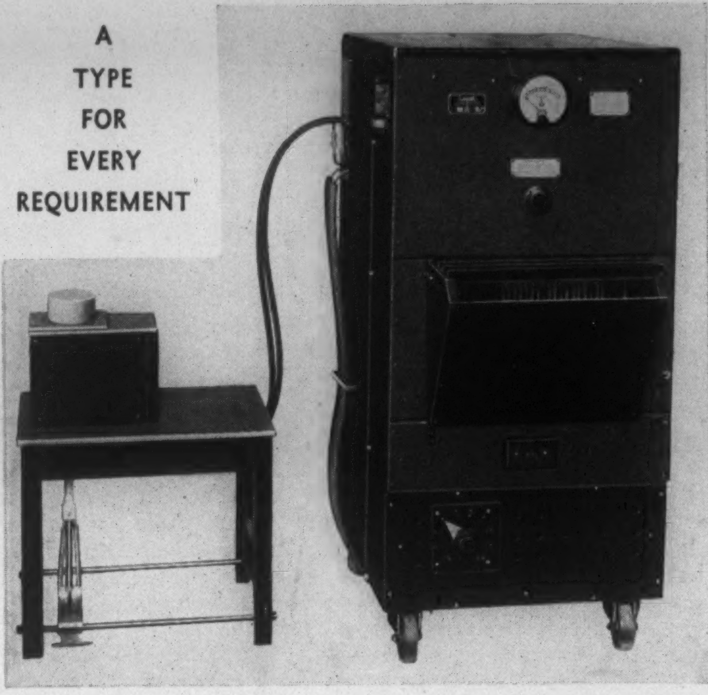

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A Study in the Metallography and Mechanical Properties of Lead. BRINLEY JONES. *Journal Institute of Metals,* Vol. 60, Jan. 1937, pages 37-54 (Advance Copy No. 761). Attention is called to structural changes in rolled Pb at ordinary temperatures, and it is stated that mechanical tests can have no significance unless these changes can be controlled or prevented. Work indicates that grain growth develops in rolled Pb at room temperature as a result of critical straining of fine-grained as-rolled material. Rolled Pb of an intermediate grain size is immune from grain growth and is affected only by strains severe enough to cause recrystallization. The structures that result from grain growth and recrystallization, respectively, after rolling are shown to be different in type. In the former the grains are well defined, infrequently twinned, and often associated with intercrystalline cracking; in the latter they are confused and repeatedly twinned. Heavily twinned, recrystallized structures have been found from experience to be desirable, and reference is made to large-scale experiments dealing with the production on a commercial basis of sheets having such structures. JLG (10)

Oxidation of Single Crystals of Zinc Sulphide Studied by Electron Diffraction. G. AMINOFF & B. BROOME. *Nature,* Vol. 137, June 13, 1936, page 995. Crystals of sphalerite were heated in air until interference colors were seen; electron diffraction analysis indicated that octahedron faces were then covered with oriented layers of ZnO crystals (hexagonal) with their *c* axes normal to the octahedron face and their *a* axes parallel to the octahedron edge. Certain "forbidden reflections" are observed and attributed to the "repeated reflections" of H. Raether (*Zeitschrift für Physik,* Vol. 78, 1932, page 536. CSB (10)

A Radioactive Isotope of Iron. E. B. ANDERSON. *Nature,* Vol. 138, July 11, 1936, page 76. Radioactivity is induced in an isotope of Fe of mass 59 by neutron bombardment. CSB (10)

Relations between Heats of Formation, Composition, and Properties of Technically Important Alloys (Die Beziehungen zwischen Bildungswärmen, Aufbau und Eigenschaften technisch wichtger Legierungen) F. KÖRBER. *Stahl und Eisen,* Vol. 56, Nov. 26, 1936, pages 1401-1411. Methods for obtaining the heats of formation of alloy compounds are discussed and values for the heats of formation of the following given: Fe-Si, Co-Si, Ni-Si, Fe-Al, Co-Al, Ni-Al, Cu-Al, Co-Sn, Ni-Sn, Cu-Sn, Fe-Ni-Al, Fe-Co-Al. SE (10)

Improvements in Metal Microscopes (Verbesserungen an Metallmikroskopen) R. PUSCH. *Stahl und Eisen,* Vol. 56, Nov. 5, 1936, pages 1330-1337; Nov. 12, pages 1362-1364. The latest improved microscope models such as the Leitz, Zeiss, and Reichert are illustrated and metallographic innovations like the use of polarized light and dark-field illumination discussed. Some remarkably good results obtained by attaching a small Leica camera to the microscope, taking a film at X40, and enlarging the film to X100, are shown. SE (10)

The System Iron-Chromium-Chromium Carbide (Cr_7C_3)-Cementite (Das System Eisen-Chrom-Chromkarbid Cr_7C_3-Zementit) W. TOFAUTE, C. KÜTTNER & A. BÜTTINGHAUS. *Arch. Eisenhüttenw.,* Vol. 9, June 1936, pages 607-617; *Tech. Mitt Krupp,* Vol. 4, Nov. 1936, pages 181-194. Original research. The system Fe-Cr-C was studied up to 70% Cr and to C content corresponding to the compound Cr_7C_3. Metallographic, thermal, dilatometric, magnetic and X-ray examination failed to disclose any new ternary crystal types; Murakami's evidence concerning segregation of the carbides $(Cr, Fe)_7C_3$ and $(Cr, Fe)_3C$ was confirmed. Experiments with 30-60% Cr alloys proved that the precipitation of Fe Cr from the α solid solution occurs in C-containing as well as pure Fe-Cr alloys. The results are shown in several phase diagrams of the ternary system and by binary sections through it. SE + Ha (10)

Determination of the Total Amount of Non-metallic Inclusions in Steel by Microscopic Means. S. M. ARONOVICH & I. M. LUBARSKI. *Metallurg,* Vol. 11, Sept. 1936, pages 89-95. In Russian. Assuming distribution of non-metallic inclusions as uniform along the length of bars and their shape as approaching cylindrical, a new method for determination of weight percentage of inclusions is proposed. The method is based on microscopic estimation of the number and relative size of inclusions and calculation of weight percentage by means of a "coefficient" and the assumed density of the inclusions. The results obtained by such visual estimation were compared with the results of determination of non-metallic content in the same areas by Fitterer's method. Almost a constant ratio (0.7) between the two was recorded. (10)

Grain Size in Steels; Testing; Effect on Properties; Control (Zur Frage der Korngrösse des Stahles, ihrer Beurteilung, ihrer Wirkung auf die Stahleigenschaften und ihrer Beeinflussung) E. HOUDREMONT & H. SCHRADER. *Stahl und Eisen,* Vol. 56, Nov. 26, 1936, pages 1412-14. A review. SE (10)

Structure Factor Graphs for Crystal Analysis. W. L. BRAGG. *Nature,* Vol. 138, Aug. 21, 1936, page 362. Graphs for greatly shortening structure-factor calculations for determining atom positions in crystals. CSB (10)

Colloid Chemical Phenomena in Metals (Kolloidchemische Erscheinungen in Metallen) J. A. KLJATSCHKO. *Kolloid Zeitschrift,* Vol. 73, Nov. 1935, pages 226-236. Gas-metal systems are treated as a problem in colloid chemistry. The general laws governing such systems, and work of previous investigators on "gas in metals" are reviewed. Marked discrepancies between the results of determinations of dissolved H_2 in Al by the equilibrium method and by the heat-extraction method are shown to exist; these are explained by reaction between the Al and H_2O vapor adsorbed in pores of the metal. FPP (10)

The Constitution of Silver-rich Antimony-silver Alloys. PETER W. REYNOLDS & WILLIAM HUME-ROTHERY. *Journal Institute of Metals,* Vol. 60, Dec. 1936, pages 645-754 (Advance Copy No. 758). The liquidus curve of the system Ag-Sb was determined accurately in the range 0-30% Sb. There is a peritectic horizontal at 702.5° C. at which α reacts with liquid to form β, which has a close-packed hexagonal structure. The phase boundaries of the α and β solid solutions were determined at temperatures above 300° C. The solid solubility of Sb in Ag is 8.05% at 702.5° C. and 6.2% at 300° C. The limits of the β phase are 8.8 atomic % Sb at 702.5° C. and 16.3% Sb at the 558.2° C. peritectic horizontal. The range of solid solubility diminishes slightly as the temperature decreases, and at 300° C. the β solid solubility limits are 8.6 and 15.6 atomic % Sb. The general form of the diagram when drawn in terms of electron concentration resembles that of the system Ag-Sn. Critical points determined are examined from the point of view of Stockdale's theory of integral atomic ratios, and of the 5 points considered only 1 corresponds to the ratio of small whole numbers. 14 references. JLG (10)

Isolated Grains in Crystals of Ferrite in Copper Bearing Steel. G. M. ZAMORUEV. *Metallurg,* Vol. 11, July 1936, pages 99-100. In Russian. Occurrence of individual grains imbedded in larger grains of ferrite may be related to lack of uniformity in crystallization conditions across a given section of the sample. (10)

11. PROPERTIES OF METALS AND ALLOYS

Asymmetry in Metallic Zinc and Cadmium. K. HERRMANN. *Nature,* Vol. 138, Aug. 13, 1936, page 290. X-ray scattering factors of Zn and Cd indicate either (a) non-spherical atoms or (b) asymmetrical lattice vibrations. Believes theory (a) more likely, from considerations of axial ratios of 21 hexagonal metals and the required rotational-ellipsoid shapes of the atoms. G. W. Brindley in reply states that theory (a) cannot be tested by X-rays for only the outer electrons are likely to depart from spherical symmetry; he maintains that theory (b) is probable. CSB (11)

Time Effects in Supra-conductors. K. MENDELSSOHN & R. B. PONTIUS. *Nature,* Vol. 138, July 4, 1936, page 29. When the magnetic field is altered, the magnetic induction in pure polycrystalline Sn takes appreciable time to reach its new value, confirming authors' theory that slow expansion or contraction of macroscopic supra-conducting regions is taking place. CSB (11)

Mechanical Properties of Metals and Alloys (Propriétés Méchaniques des Métaux et Alliages) L. GUILLET, JR. *Usine,* Vol. 44, Nov. 5, 1936, page 31. Physical and chemical methods and instruments for studying mechanical properties are briefly reviewed. Ha (11)

Characteristics of Materials Used for Valves in Internal Combustion Engines (Caratteristiche dei Materiali destinati al Ricavo delle Valvole pei Motori a Combustione interna) C. A. MARESCA. *Ind. Meccan.,* Vol. 18, Nov. 1936, pp. 689-693; Dec. 1936, pp. 763-766. A study of the stresses leading to failure and the metallurgical changes in the valves. 14 compositions used in valves are described, and mechanical properties and resistance to corrosion given. Ha (11)

11a. Non-Ferrous

A. J. PHILLIPS, SECTION EDITOR

Thermal and Electrical Conductivities of Aluminum Alloys. L. W. KEMPF & C. S. SMITH. *Metals Technology,* Jan. 1937, *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 783, 12 pages. Thermal and electric conductivities of 11 commercial Al alloys were determined in various structural conditions. Data on thermal and electric conductivities in the literature are reviewed critically. On the basis of all available data the following expression appears to give the relation between thermal and electric conductivity and absolute temperature within about ±6%:

$$K = 5.02\,\lambda T \times 10^{-9} + 0.03,$$

where K is the thermal conductivity, λ the electric conductivity, and T absolute temperature. The expression is valid for the temperature range 0 to 400° C. Electric conductivities of 42 commercial Al alloys were determined in various structural conditions and thermal conductivities calculated from the electric conductivity. 12 references. JLG (11a)

A New Kind of Ring Phenomenon in Sputtered Metallic Films. U. K. BOSE. *Nature,* Vol. 138, Oct. 17, 1936, page 684. Metals sputtered on a glass plate will form colored rings if a drop of plasticine or oleic acid is on the glass. Explanations are suggested. CSB (11a)

Influence of Temperature on Elastic Limit of Single Crystals of Aluminum, Silver and Zinc. RICHARD F. MILLER & W. E. MILLIGAN. *Metals Technology,* Jan. 1937, *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 782, 18 pages. Slow tensile tests on ductile Zn single crystals at room temperature and 300° C. show that the magnitude of the apparent elastic range depends on the speed of testing, and the conclusion drawn from creep tests, that in this temperature range there is no measurable critical shearing stress, is supported. Slow tensile tests on Al and Ag single crystals showed that there is a small but definite elastic range below the recrystallization temperature. This range is smaller the lower the temperature. Above recrystallization temperature critical shearing stress decreases rapidly. A marked "yield-point elongation" (zone intermediate between elastic and plastic ranges) was noted in Al single crystals, which was more marked the lower the temperature of test and the purer the metal. During this period, increase of temperature decreased rather than increased the rate of flow. Following this period, the stress-strain curves crossed, and the temperature effect was normal; that is, the rate of flow increased with increased temperature. 13 references. JLG (11a)

Improvement of the Properties of German Silver, Phosphor Bronze and Tin-Zinc Bronze. G. F. RADCHENKO. *Metallurg,* Vol. 11, Sept. 1936, pages 81-88. In Russian. Yield points and moduli of elasticity of spring stock made from the above materials are not at all uniform. Quite uniform properties can be produced in P bronze by deforming it 75-80%, which is above the critical deformation, and annealing it below 300° C., the temperature at which recrystallization begins. Low temperature annealing rapidly increases elastic limit determined by bending in all 3 materials, somewhat increases elastic modulus and raises elongation, slightly in case of German silver and pronouncedly for bronzes. Uniformity in all material is improved by the treatment. (11a)

Metal Spraying: Processes and Some Characteristics of the Deposits. E. C. ROLLASON. *Journal Institute of Metals,* Vol. 60, Jan. 1937, pages 7-35 (Advance Copy No. 760). Spray guns using wire, powder and molten metal are described. The nature of the sprayed deposit is discussed. Results of salt spray tests on Zn and Al deposits and on painted Zn coats are given. Heat-treated Ni-Cr-Fe coatings were found to have good resistance to oxidation at elevated temperatures. Data on porosity of sprayed metals are given. Owing to its low cost, the powder process will undoubtedly prove successful in spraying large surfaces with Zn, especially when the coat is subsequently painted. The powder-spray gun also offers the possibility of spraying brittle metals and alloys of high melting point which can not be drawn into wire. 69 references. JLG (11a)

Creep of Lead and Lead Alloys. Part I.—Creep of Virgin Lead. J. McKEOWN. *Journal Institute of Metals,* Vol. 60, Dec. 1936, pages 623-644 (Advance Copy No. 757). Tensile creep tests up to 300 days in duration were made on specimens of virgin Pb in the form of extruded rod, extruded pipe, and extruded cable sheath. Tests were made at room temperatures (in a basement) and at 80° C. Grain size has a marked effect on creep rate, finer grained material being less resistant to creep. Working, such as flattening specimens cut from pipe influences creep. For Pb the minimum rate of creep occurs after about 4% elongation. Limited data indicate that the log of minimum rate of creep plotted against the log of stress gives a straight line for constant temperature. It is considered that Pb even at room temperature is above the equicohesive temperature and that flow takes place in grain boundaries. In several samples tested at low stresses intercrystalline cracking was observed. 17 references. JLG (11a)

The Shrinkage of Magnesium Alloys (Über die Schwindung von Magnesiumlegierungen) P. SPITALER. *Metallwirtschaft,* Vol. 15, Dec. 18, 1936, pages 1221-1227. Shrinkage measurements carried out in 1924-1925 on magnesium alloys are presented. The methods for determining decrease in volume with temperature are reviewed, and the apparatus used in the reported research is described. The shrinkage coefficient (percentage decrease in elongation from original length) of Mg decreases upon adding Ni, Cu, Al, or Zn, but is affected only slightly by additions of Si and Cd. Al and Zn are the most effective, and the Mg corner of the Mg-Zn-Al system with lines of equal shrinkage coefficient is presented. The author concludes that the shrinkage coefficient is dependent upon the temperature at which shrinkage starts and upon the temperature coefficient of expansion. GA (11a)

Properties of Magnesium Alloys with an Increased Content of Manganese. V. O. HAGEN-TORN & YA. A. TZENTER. *Metallurg,* Vol. 11, July 1936, pages 85-91. In Russian. Kroenig *(Proceedings of the Metal Corrosion Conference,* USSR Academy of Sciences, 1935, page 419) showed that 1.36% of Mn added to Mg alloys greatly reduces their corrosion in sea water. The present investigation covered properties of alloys containing about 1% Mn, 1-4.2% Al to which either Zn or Cd were added. Maximum Zn addition was 2.3% and that of Cd 0.5%. Mn could be introduced in the metal only by reducing $MnCl_2$ flux with Mg, which resulted in 75% recovery of Mn and a 15-18% consumption of Mg. The alloys are not affected by heat treatment. The best physical properties were obtained with an alloy containing 2% Al, 0.5% Cd, 1.0% Mn, which had a tensile strength of 43,000 lbs./in.^{2} and elongation of 16%. Quenched specimens were considerably more corrosion-resistant in sea water than the annealed. Quenching did not retain a solid solution structure. Artificial aging causes coagulation of the precipitated products, without increasing the strength of the metal. **(11a)**

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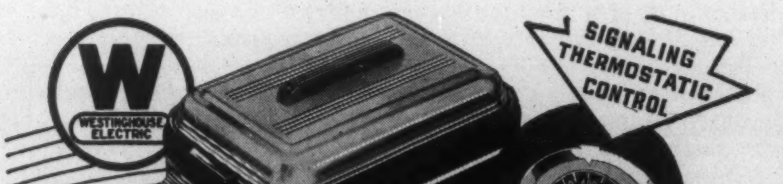
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The Influence of Beryllium on Magnesium Alloys. K. V. Peredelskii. *Legkie Metal.,* Vol. 5, May 1936, pp. 39-45. In Russian. The addition of 0.05% Be to alloys containing 92% Mg and 8% Al prevents oxidation while melting and casting and increases resistance to corrosion by salt water. Mechanical properties of the alloy are not changed. HWR (11a)

Alteration of the Free Surface Energy of Solids. 1. Vertical Rod Method for the Measurement of Contact Angles and Preliminary Study of Effect of Heat Treatment on Magnitude of Contact Angles. F. E. Bartell, I. L. Gulbertson & Mike A. Miller. *J. Phys. Chem.,* Vol. 40, Oct. 1936, pp. 881-888. A method called the vertical rod method has been developed for the measurement of contact and interfacial contact angles against either transparent or opaque solids. The method gives information concerning free surface changes on the surface of solids and has been tried out on Au, Pt, SiO_2 and Pyrex glass. The method of pretreatment of a solid surface is important in a study of its surface properties. Aging of glass and metal surfaces increases the magnitude of the solid-liquid-air contact angle formed upon them. Heat treatment can greatly alter the magnitude of the contact angle. **II. Effect of Heat Treatment of Metals in Air,** pp. 889-894. Rods of Au and Pt were given a special pretreatment so as to have standard surfaces for references. Such a standard surface could not be produced on rods of steel treated in air at 100°-600° C. With low-temperature treatment, the metals were fairly strongly organophilic and could even be caused to become hydrophilic in nature. The changes are assumed to be due to oxidation and recrystallization. The surface properties were found to alter with time of standing after heat treatment. **III. Effect of Heat Treatment of Metals in a Vacuum and in Several Gases,** pp. 895-903. Rods of Au, Pt, Cu, 18/8, Ag, Al, W and brass were pretreated so as to have standard reference surfaces. Heat treatment of the metals in a vacuum caused them to become more hydrophilic with increasing heat treatment. The metals became progressively less hydrophilic when heat treated in a vacuum, in H, air, and N in the order stated. All the metals except Pt and W, when heat-treated in N, readily reacted chemically with acetylene tetrabromide; Au, Cu and brass similarly treated reacted with α-bromonaphthalene. Al and W, heat treated in H, reacted with acetylene tetrabromide. The wetting characteristics of surfaces of the same metal differ greatly depending upon the precise pretreatment of the metals. EF (11a)

11b. Ferrous

V. V. KENDALL, SECTION EDITOR

Allotropic and Magnetic Transformations. S. S. Steinberg. *Metallurg,* Vol. 11, Sept. 1936, pages 6-10. In Russian. A note. Allotropic transformations are discontinuous processes of recrystallization and are governed by the laws of phase equilibrium. Magnetic changes occur in homogeneous phases continuously and in long temperature intervals and are not controlled by the phase laws. (11b)

Transformer Steel with Increased Permeability Along the Direction of Rolling. A. S. Zaimovski & L. S. Kazarnovski. *Kachestvennaia Stal,* Vol. 4, No. 8-9, 1936, pages 19-22. In Russian. Transformer steels containing 3.40% Si were cold rolled and annealed, after which their magnetic anisotropy was studied with Weiss dynamometer. One cold rolling-annealing cycle does not arrange (100) axes along the direction of rolling. Double cold rolling to 60-65% and annealing at 1050-1100° C. rearranges them along the direction of rolling and increases permeability. (11b)

Stainless and Heat-resisting Iron-chromium Cast Alloys. *Foundry Trade Journal,* Sept. 24, 1936, pages 233 and 240. The corrosion resistance of Fe-Cr alloys increases rapidly at about 13% Cr. By adding C, however, the resistance of the annealed alloys decreases in proportion to the amount added. This is due chiefly to the formation of Cr carbides (especially Cr_7C_3), which deprive the ground mass of part of Cr. On the other hand, C-containing alloys cast more easily than do the stainless steels. To make full use of the excellent properties imparted by Cr, a fairly high amount of this element must be added to C-containing Fe. Alloys of that kind have been investigated by E. Houdremont and R. Wasmuht *(Die Giesserei,* Vol. 19, 1932, pages 322-325. See *Metals and Alloys,* Vol. 3, July 1932, page MA 203). The compositions of the Fe studied were (1) C 1.1%, Si 1.3%, Mn 0.42%, Cr 33.6%; (2) C 2.3%, Si 1.4%, Mn 0.40%, Cr 34.2%; (3) C 3.1%, Si 1.2%, Mn 0.38%, Cr 34.9%. The ledeburite point which in straight Fe-C alloys is at 4.2% C is displaced to about 2.5% by adding 34% Cr. It was found that Si acts in the same way, whereas austenite forming elements, such as Mn and Ni, displace the ledeburite point to higher C contents. The resistance of alloys against the attack of various chemical reagents, their heat resistance, shrinkage allowance, tensile strength, hardness, etc., are discussed. AIK (11b)

Comparative Study of Methods for the Determination of Oxygen in Steel. J. G. THOMPSON, H. C. VACHER & H. A. BRIGHT. *Metals Technology, American Institute Mining & Metallurgical Engineers, Technical Publication* No. 758, Dec. 1936, 44 pages. Samples of 8 different steels were sent by the National Bureau of Standards to laboratories in this and other countries for determination of O or oxides. Results obtained by 34 laboratories are tabulated and discussed. Methods used by different laboratories included vacuum fusion, I, H reduction, electrolytic, $HgCl_2$, Cl, fractional vacuum fusion, HNO_3, and HCl. It was concluded that vacuum fusion yielded accurate results for all 8 steels. Recommendations for procedure and apparatus to be employed in vacuum fusion are made. SiO_2 and Al_2O_3 as they occur in the steels studied are completely reduced in vacuum fusion, and the error resulting from interference of Mn, at least up to 1% Mn, is not serious. Chief cause of erratic results is spattering. Aqueous-I method yielded accurate results for Al-killed and for some Si-killed steels, but for other steels low results were obtained. None of the other methods were represented by sufficiently concordant data to justify definite conclusions. The H-reduction method yielded results of the same order of magnitude as the vacuum fusion, but further work to standardize the procedure of H reduction is necessary. JLG (11b)

Effect of Melting Practice and Heat Treatment on the Toughness of Carburizing Steel (Beeinflussung der Zähigkeit von Einsatzstählen durch Herstellungsart und Wärmebehandlung) H. SCHRADER. *Stahl und Eisen,* Vol. 56, Oct. 1, 1936, pages 1201-1210. Killing with Al results in a tougher core in carburized steel. Cr-Mo steels appear to require a narrower hardening range than Cr-Ni steels. SE (11b)

Permanent Magnetization of Steel by a Rapid Aperiodic Discharge (Aimantation Permanente de l'Acier par une Décharge Apériodique Rapide) R. CHEVALLIER & M. LAPORTE. *Journal de Physique et le Radium,* Vol. 7, Nov. 1936, pages 453-460. The magnetization of steel samples of various forms (rings, discs, filings, etc.) by a rapid aperiodic discharge traversing a rectangular-section wire is reversed in the region close to the wire, vanishes at the neutral point, then becomes normal, reaches a maximum and declines. Inversion is therefore independent of the periodicity of the discharge. The magnetization follows the same lines as the field, and includes no transverse component. Foucault currents apparently play a negligible role, at least in sheet and square wire samples. The neutral point moves away from the rectangular conductor as the demagnetizing coefficient of the sample decreases. Its position and that of the maximum do not depend on the number of discharges for a given type of sample although the intensity of the maximum grows with this number. The equivalent field H_o, at equal distances d, varied according to a complex law depending on previous thermal or magnetic treatment of the steel. FPP (11b)

Aluminum in the Steel Industry (L'Aluminium en Sidérurgie) J. BALLY. *Revue de l'Aluminium,* Vol. 13, Sept.-Oct. 1936, pages 307-316; November 1936, pages 425-432; December 1936, pp. 473-490. To ordinary steels are added 5.40 and to special steels 100-150 gk. of Al/ton. The physical and chemical properties of the Al-containing steels are discussed. Specific heat is increased from 0.11 to 0.13 by the addition of 0.8 to 15.5% Al. Thermal conductivity is diminished from 0.050 to 0.024 if the Al content is raised from 11.18 to 16.06%. The electrical resistivity is, at normal temperature, increased proportionally to the content of Al; above 600° C. the temperature coefficient decreases, especially with 11% Al. Magnetic properties: low C, Ni-steels containing 8-20% Al, particularly those with 25% Ni and 10-12% Al are used as permanent magnets. These alloys are neither forgeable nor machinable. Resistance to the attack of fused metals, to corrosion and to oxidation is increased by Al addition. Some heat resisting steels described are: Feralloy, binary with 14% Al and ternary with a slightly reduced content of Al and 3.5% Cr used in pyrite ovens; RNC 44 with 30% Cr, 2.5% Co and 3.5% Al are used for similar purposes. Among the Si containing steels with 0.5-4% Al and 6-22% Cr, Sicromal Nos. 6-12 are heat resistant from 600-1200° C. They may be rolled, forged and drawn; welds are made with Al-free rods. Applications are illustrated. Second part reviews effect of Al additions on the structure and mechanical properties of alloy Fe and steel. The third part discusses variation of electric resistivity of Al-Fe and of Al-Fe-Cr alloys with the content of Al and permanent magnet alloys, their history, properties and application. HR (11b)

Tantalum-Iron Alloys and Tantalum Steels. R. GENDERS & R. HARRISON. *Engineer,* Vol. 162, Nov. 20, 1936, pages 541-542. Includes discussion. See *Metals and Alloys,* Vol. 8, Apr. 1937, page MA 230L/1. LFM (11b)

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12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

H. C. CROSS, SECTION EDITOR

The abstracts in this section are prepared in co-operation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M. The purpose of this co-operation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

Effect of Temperature on the Properties of Metals, Report of Joint Research Committee. H. J. FRENCH, CHAIRMAN. *Proc. Am. Soc. Testing Materials,* Vol. 36, Pt. I, 1936, pp. 127-131. Progress report. **Appendix I.—General Summary and Comparison of Procedure and Results Obtained on Cooperative Study of Low-Temperature Impact Testing of 0.35 per cent Carbon Steel (K 20). Summarized for Subcommittee P from the Reports of Eleven Laboratories by** R. SERGESON & S. W. POOLE, pp. 132-142. Data are given in the form of curves and tables. Although good reproducibility of the testing technique seemed to be obtained, the results were quite discordant and it would be difficult to predict the temperature at which this steel would be unfit for service. Data are also given on high-velocity impact tests. **Appendix II.—Report on Long-time Creep Tests of 18 per cent Chromium, 8 per cent Nickel Steel and 0.35 per cent Carbon Steel.** H. C. CROSS & F. B. DAHLE, pp. 143-150. Long-time creep test data are reported for an 18-8 Cr-Ni steel tested at 1200° F. and a 0.35% C steel tested at 850° F. Two 18-8 specimens have been under test for 10,125 and 11,680 hrs. at a load of 8345 lbs./in.^{2} at 1200° F. Two 0.35% C steel specimens have been under test at 850° F. for 9620 and 8690 hrs. at loads of 8000 and 7500 lbs./in.^{2} respectively. Linear extrapolations to 10,000 hrs. at rates of creep obtained during the period from 1000 to 2000 hrs. would be conservative for the 0.35% C steel but misleading for the 18-8 steel at these loads and temperature. See also *Metals and Alloys,* Vol. 7, Apr. 1936, p. MA 206R/4.
VVK (12)

Relation of Temperature to the Intensity of Magnetization of Ferromagnetic Substances in Weak Magnetic Fields (Ueber die Temperaturabhängigkeit der Magnetisierungsintensität der Ferromagnetischen Substanzen im Schwachen Magnetischen Felde) KOTARO HONDA & TAMOTSU NISHINA. *Z. Physik,* Vol. 103, Dec. 11, 1936, pp. 728-737. In German. Original research and mathematical discussion. Measurements were made on rods of single crystals of Fe, polycrystalline electrolytic Fe and polycrystalline Ni to show the relation between temperature and the intensity of magnetization in weak magnetic fields. The authors claim the result of their tests can be explained on the basis of the Honda-Ökubo theory of crystallographic anisotropy. See also *Metals and Alloys,* Vol. 7, June 1936, p. MA 309R/1.
FHC (12)

Obtaining Time-deformation Curves with W. Rohn's Creep Testing Apparatus (Aufnahme von Zeit-Dehnungs-Kurven mit dem Kriechgrenzengerät von W. Rohn) A. GRUNERT & W. ROHN. *Arch. Eisenhüttenw.,* Vol. 10, Aug. 1936, pp. 67-68. Time-Deformation curves with Rohn's apparatus of several steels are shown. See also *Metals and Alloys,* Vol. 4, June 1933, p. MA 197L/5.
SE (12)

A Direct-load Creep-test Machine. J. J. CURAN & F. H. MOREHEAD. *Proc. Am. Soc. Testing Materials,* Vol. 36, Pt. II, 1936, pp. 161-169. Description of design and operation of a direct-load creep-test machine.
VVK (12)

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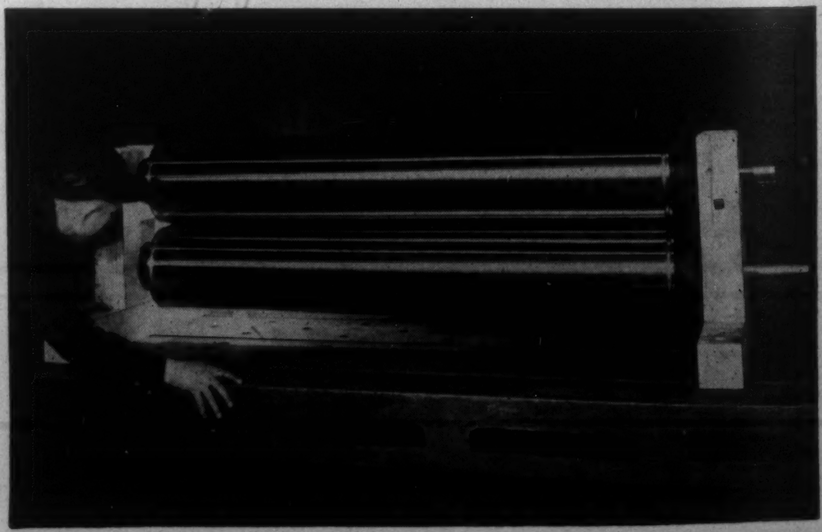

Centrifugally cast rolls used in process work. These were cast, ground and polished in our shop.

13. CORROSION AND WEAR

V. V. KENDALL, SECTION EDITOR

Pipe Corrosion and Coatings. ERICK LARSON. *American Gas Journal,* Vol. 145, Nov. 1936, pages 57-62, 82; Dec. 1936, pages 19-22, 58. The general characteristics of soils and surrounding conditions which have been found to affect the rate of corrosion include chemical, electrical, geological, biological, climatalogical, historical and artificial. Effects of alkalinity and acidity of soils and the electrical characteristics of soils are discussed. CBJ (13)

Sodium Chromate as an Inhibitor of Caustic Corrosion of Aluminum (Ueber die Schutzwirkung von Natriumchromat bei den Auflösung von Aluminium in Natronlauge) J. FISCHER & W. GELLER. *Korrosion & Metallschutz,* Vol. 12, Oct. 1936, pages 297-299. Strong attack of Al and its alloys by caustic solutions can be almost completely suppressed by addition of 1-3% Na_2CrO_4; the surface of Al is then passivated. The greater the purity of Al, the more pronounced is the inhibitive action. Ha (13)

Preserving the Corrosion Resistance of Stainless Steel. JAMES GOLDER. *Mechanical World & Engineering Record,* Vol. 99, Apr. 17, 1936, pages 393-394, 406. Discusses and illustrates the effects of mis-treatment on the austenitic structure of 18/8 and 18/14 NiCr types of stainless steel, and therefore on corrosion resistance. WH (13)

Application of the Potentiometric Method to Forecasting Corrosion of Ferrous Alloys (Application des Méthodes Potentiométriques a la Prévision de la Corrosion des Alliages Ferreux) LOUIS GUITTON. *Comptes Rendus,* Vol. 203, Nov. 23, 1936, pages 1066-1068. Samples of steels in the shape of flat plates were immersed and the loss of weight versus the potential was measured. The simple potentiometric method was used and a special microelectrode adapted to measurement of 1 cm.^{2} surface of the metal. Charts were drawn to show the loss of weight versus the potential and, by calculating the equation for the curves, the authors hoped to predict the loss of weight if the potential were known. FHC (13)

Note on the Chemical Intercrystalline Fracture of Rivetted Joints in Boilers. S. F. DOREY. *Trans. Inst. Naval Arch.,* 1937. Advance Copy, Paper No. 3, 7 pp. Up-to-date review. A few cases of intercrystalline fracture in the riveted joints of the shells of marine boilers are discussed. Cracking begins at rivet holes and on surfaces in contact, and consequently is very difficult to locate, but is usually indicated by the presence of broken rivet-heads or points. Phenomenon may not be due to the action of pure caustic, but to the presence of sodium silicate in the soda and in other chemicals used in boilers, so that particular care should be taken that sodium silicate is not added to boiler water, and only enough soda to maintain neutrality should be used. (This is a new theory that will require further investigation.) JWD (13)

The Use of Monel and Other Nickel Alloys for Bleaching. G. L. COX & F. L. LAQUE. *Am. Dyestuff Reptr.,* Vol. 26, Mar. 8, 1937, pp. 127-132. A survey. The behavior of Monel and other non-ferrous nickel alloys in hypochlorite bleaching solutions is determined principally by: (1) the concentration of available Cl, (2) the duration of each individual contact of the metal with the solution, (3) the condition of the metal surface, e.g. smoothness, and (4) the presence of corrosion inhibitors, e.g. sodium silicate. Major factors which influence the stability of a peroxide bleach bath are listed and a number of instances of the successful use of monel in bleaching operations illustrated and described. WHB (13)

The Carinthian Iron-minium as Protection against Corrosion and a Mill for Grinding the Raw Material (Das Kärtner Eisen-Minium im Korrosionsschutz und eine Mühle zum Mahlen des Rohstoffes) E. BELANI. *Chem. App.,* Vol. 24, Feb. 25, 1937, pp. 52-53. This material consists of 93.94% Fe_2O_3 (with a small amount of Fe_3O_4), 3.85% SiO_2, 0.80% Al_2O_3, 1.40% CaO, and traces of MgO. It is an excellent pigment for linseed oil paints on metal and wood. Method of preparation from Carinthian hematite is described. HR (13)

Recent Trends in Pipe Protection and Maintenance. ARTHUR B. ALLYNE. *Gas Age-Record,* Vol. 77, May 2, 1936, pp. 465-468. A general discussion of soil surveys for pipe lines, use of shields in connection with protective coatings, "holiday" detectors, cathodic protection, internal corrosion and dehydration of gas. VVK (13)

Rate of Solution of Magnesium in Acids. J. V. DURDIN & A. M. MARKEVITCH. *Zhurnal Obshey Khimii,* Vol. 6, 1936, pages 236-249. In Russian. Rate of solution of Mg in acids depends on H^+ concentration and agitation and is independent of concentration of reaction products. The temperature coefficient of reaction velocity decreases with rising temperature. NA (13)

The Effect of Pressure on the Passivity of Iron Powder in Alkali Medium. TZU CHING HUANG. *Journal of the Chinese Chemical Society,* Vol. 4, Sept. 1936, pages 406-412. In English. Equal amounts of Fe powder of 0.23 mm. diameter were introduced into perforated Ni tubes and compressed under 0-400 lbs. The electrodes made of the powder samples were tested in an aqueous solution of 21% KOH, the other electrode being Ni oxide. The measurement of the discharge potentials at definite intervals shows clearly that increase of packing pressure increases the electromotive activity and therefore decreases the passivity of Fe powder. EF (13)

Corrosion of Steel. *Iron & Coal Trades Review,* Vol. 133, Nov. 20, 1933, pages 903-904. The findings of the Corrosion Committee of the Iron & Steel Institute are described in Special Report No. 13. The effect of atmospheres at different places in England on the life of galvanized steel, degree of protection given by different kinds of surface coatings, and means for protection against marine corrosion are described. Ha (13)

Effectiveness of Oils for Rust Protection (Wirksamkeitsgrenzen von Rostschutzölen) F. HEINRICH & E. SCHUTH. *Stahl und Eisen,* Vol. 56, Oct. 1, 1936, pages 1210-1211. Oils like vaseline are able to protect cold rolled strip from rusting fairly well at room temperature so long as the air is fairly dry. Unfatted mineral oil will protect up to a humidity of 60-70%; natural vaseline up to 80% humidity; fatted mineral oil up to 80-90% humidity, and fatted vaseline up to 100% humidity. The protection increases with the viscosity of the oil. SE (13)

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Atmospheric Corrosion Tests on Wire and Wire Products Begun by A.S.T.M. *Steel,* Vol. 99, Dec. 21, 1936, pages 51, 54. From *Bulletin,* A.S.T.M., No. 83, Dec. 14, 1936, pages 3-6. MS (13)

Wear of Cast Iron Piston Rings in Crude Oil Motors (Verschleiss von gusseisernen Kolbenringen in Rohölmotoren) K. SIPP. *Stahl und Eisen,* Vol. 57, Jan. 14, 1937, pages 42-43. Cast Fe with coarse graphite in a pearlitic groundmass gives better wear than Fe in which the graphite flakes are very fine. SE (13)

The Institution of Gas Engineers. *Engineering,* Vol. 142, Nov. 13, 1936, pages 539-541. Briefly comments on a report of the Institution dealing with corrosion from products of combustion of gas. LFM (13)

Research on the Corrosion of Iron and Steel. *Engineering,* Vol. 142, Nov. 6, 1936, page 512. Very brief survey of the contents of the Fourth Report of the Joint Corrosion Committee of the Iron and Steel Institute and the British Iron and Steel Federation to the Iron and Steel Industrial Research Council. LFM (13)

Metal Spraying in the Plastic Industry. J. BARRINGTON STILES. *The Metallizer,* Vol. 8, Aug.-Sept. 1936, page 4. Metal spraying is successfully applied in overcoming wear and corrosion difficulties with hydraulic rams, hydraulic valve spindles and to some extent in repairing and reconstructing dies. Wide choice of coating metals, such as stainless steel, high carbon steel, Monel metal, etc., frequently give better surfaces than were originally present on the equipment. Spraying molded articles with metal for decorative effects and to secure electrical conductivity are well established applications. BWG (13)

Noteworthy Applications of the Less Common Metals in Chemical Equipment (Bemerkenswertes über die Verwendung von Sparmetallen im chemischen Apparatebau) BLOCK. *Chemische Fabrik,* Vol. 9, Feb. 5, 1936, pages 65-67. The corrosion-resisting properties of the more expensive metals Ag, Ni and Cu may be conferred on steel by plating the latter with one of the former. Electrolytic and other methods of coating steel are discussed and several applications illustrated. FPP (13)

Rust Inhibiting of Structural Steel Accomplished Soundly, Scientifically. *Steel,* Vol. 99, Dec. 28, 1936, pages 44, 46. Describes the Synhibit process developed by Thompson & Co., Pittsburgh, Pa. Loose rust or scale on surface is removed by wire brushing, followed by treatment with an inhibitor which contains H_3PO_4, a Cr compound, solvents, and dispersing agents. It is claimed that remaining rust is destroyed or rendered passive, and that there is deposited a complex Fe-Cr phosphate to which primer and paint adhere with great tenacity. Inhibitor treatment is followed by application of a $ZnCrO_4$, Fe_2O_3, synthetic vehicle primer. Al finish coat is recommended for final coating. MS (13)

Corrosion-Resistant Alloys. A Symposium on Their Use in the Design of Machinery and Equipment. *Mechanical Engineering,* Vol. 58, Dec. 1936. **Introductory Paper,** F. N. SPELLER, pages 781-783. **Aluminum and Its Alloys,** E. H. DIX, JR., & R. B. MEARS, pages 784-792, 33 references. **Corrosion Resistant Lead Equipment,** GEO. O. HIERS, pages 793-798, 29 references. **Zinc in the Chemical Industries,** E. A. ANDERSON, pages 799-802, 10 references. **Cast Iron in Chemical Equipment,** H. L. MAXWELL, pages 803-808, 845. **Copper and Copper-base Alloys,** R. A. WILKINS, pages 809-822, 117 references. **Corrosion-Resistant Stainless Steels and Irons,** J. H. CRITCHETT, pages 823-826. **Nickel and Nickel-base Alloys,** F. L. LAQUE, pages 827-843. All papers contain very complete tables of mechanical properties and of resistance of the various alloys to chemical attack. Ha (13)

Mechanism of Diffusion through Protective Oxides and the Influence of Pressure on the Speed of Oxidation of Ni (Mécanisme de Diffusion à Travers les Oxydes Protecteurs et Influence de la Pression sur la Vitesse d'Oxydation du Nickel) GABRIEL VALENSI. *Comptes Rendus,* Vol. 203, Nov. 30, 1936, pages 1154-1156. Theory showing that the speed of oxidation of a metal depends on the speed of penetration of O_2 through the oxide is mathematically developed. Results of experimental work are given by curves representing the speed of oxidation of Ni at constant temperature but with increasing pressure. **Introduction to the Kinetics of Oxidation of Metals Giving Two Oxides (Introduction à la Cinétique de l'Oxydation des Métaux Donnant Deux Oxydes)** *Ibid,* Dec. 7, 1936, pages 1252-1254. When O reacts with a metal of more than one valence, all oxides are formed simultaneously in distinct layers, with that of lowest O content nearest metal. Equations are given to show that at a fixed temperature and pressure, a metal with 2 valences produces its 2 oxides in a constant proportion but that the weight of O absorbed is proportional to the time. FHC (13)

The Corrosion of Electric Arc Welded Aluminum Sheet (Die Korrosion von elektrisch geschweisstem Aluminiumblech) E. W. ZECHNOWITZER. *Elektroschweissung,* Vol. 7, Nov. 1936, page 225. Abstr. from the reports of the 1st Conference on Corrosion of Metals published by the USSR Academy of Sciences. C and metal-arc welded Al sheet, containing 0.21% Si, 0.75% Fe and 0.34% Cu, was preferentially attacked in the weld by NaOH and HCl solutions and attacked by seawater and by NaCl and H_2O_2 solutions. In most cases the unwelded samples were more attacked than the welded samples, especially the C-arc welded sheets showed particularly good resistance. HR (13)

The Annual Rust Loss of Steel in Germany (Der jährliche Rostverlust an Stahl in Deutschland) G. SCHAPER. *Stahl und Eisen,* Vol. 56, Oct. 15, 1936, pages 1249-1250. It is calculated that this amounts to 120 million RM. SE (13)

Refrigerating-Plant Corrosion. W. R. SINCLAIR. *Chemical Trade Journal and Chemical Engineer,* Vol. 99, Nov. 13, 1936, page 404. From paper read before British Association of Refrigeration. Deals with internal corrosion in vapor-compression systems. Presence of H_2O is direct or indirect cause. It is almost impossible entirely to eliminate H_2O from new plants. Heating and blowing air through coils, careful pumping out, and production of vacuum reduce amount as far as practicable. Chemical and mechanical dehydrators are placed either in gas or liquid circuits. Newer refrigerants require more care to keep H_2O out than do older refrigerants. HCl is usually produced from halogenated substances. Only ferrous materials are permissible in NH_3 plants, although Monel Metal and other Cu alloys are used for certain parts. MS (13)

An Aluminium Statue of 1893: Gilbert's "Eros." R. S. HUTTON & RICHARD SELIGMAN. *Journal Institute of Metals,* Vol. 60, Dec. 1936, pages 655-661 (Advance Copy No. 759). After 38 yrs.' exposure the Al statue in Piccadilly Circus, London, is free from serious corrosion. Spectrographic analysis indicates that the statue was made from unalloyed Al. Analyses of old samples of Al made by Na reduction and old samples of undetermined origin were made, but results did not prove whether or not metal of "Eros" was from Na-reduced Al. JLG (13)

Solution Potentials of Aluminum and Light Alloys (Sur les Potentiels de Dissolution de l'Aluminium et des Alliages Legers) PAUL LACOMBE & GEORGES CHAUDRON. *Revue de Métallurgie,* Vol. 33, Dec. 1936, pages 697-704. See *Metals and Alloys,* Vol. 7, Nov. 1936, page MA 542L/2. JDG (13)

Advances Made in Prevention of Rust on Unpainted Steel Parts in Storage. *Steel,* Vol. 99, Dec. 7, 1936, pages 60, 62, 80. Two types of products formed by oxidation of petroleum hydrocarbons have been found to have outstanding properties as anticorrosives. One consists of fatty acids and related compounds. Other consists of neutral, unsaponifiable alcohols, keto-alcohols, and ketones. On metal surfaces, both form thin continuous films, which are unaffected by cold, heat, moisture, and NaCl spray, and, in certain cases, are highly resistant to acid fumes and gaseous halogens. Fatty acid type is unsuitable for use on metals other than Fe and steel, or in presence of alkalis. MS (13)

The Use of Non-ferrous Metals Underground. K. H. LOGAN. *Oil Gas J.,* Vol. 35, Sept. 24, 1936, pp. 137, 174-179. A condensed report of the non-ferrous part of the Bureau of Standards soil corrosion investigation, the complete report of which will appear in the *B. S. J. Research.* General conclusions are as follows: No non-ferrous metal has been found suitable for all soil conditions but for each condition one or more metals or alloys are available which resist soil corrosion very well. Cu and brasses high in Cu are suitable for soils free from sulphides, and Pb is very resistant to soils containing S compounds. Metallic coatings extend the life of buried materials but under some soil conditions offer only temporary protection. Of the metallic coatings tested, the Zn coatings appeared the best in most soils. For best results the characteristics of the soils must be known and the materials must be selected in the light of this knowledge. See also *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 551L/3. VVK (13)

Steel Pipe Cleaning and Coating Plant of the Bureau of Water Works and Supply of Los Angeles. LAURANCE E. GOIT. *J. Am. Water Works Assoc.,* Vol. 28, Sept. 1936, pp. 1393-1421. Detailed directions including specifications of methods of conditioning water main pipe. VVK (13

Concealed Corrosion of Insulated Metal Panels. HUGH G. BERSIE. *Iron Age,* Vol. 138, Dec. 17, 1936, pages 52-53, 109. Discusses the corrosion of insulated panels used in air conditioning and suggests preventive measures such as: Zn coating, application of paint or porcelain enamel, and use of neutral and non-hygroscopic cement. VSP (13)

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The Analytical Control of Anti-corrosion Water Treatment. W. F. LANGELIER. *J. Am. Water Works Assoc.,* Vol. 28, Oct. 1936, pp. 1500-1521. An equation is derived for pH_s, the pH at which a given water is in equilibrium with solid calcium carbonate. The difference, $pH_{actual} - pH_s$, is called the Saturation Index. If the Index is zero, the water is in equilibrium at that temperature. A positive Index indicates oversaturation, and a tendency to crystallize or to lay down a protective coating of $CaCO_3$ in the pipe, and a negative Index indicates undersaturation, or a tendency to dissolve an existing carbonate coating. The effects of various forms of water conditioning, i.e. zeolite softening, lime-soda softening, coagulation with alum, contact with limestone, dosing with caustic soda or lime, etc., upon the Saturation Index are discussed and examples from practice are given. The Index is shown to correlate with the published results of a 6 yr. study of interior pipe corrosion by the N. Y. City Water Dept. The Index furnishes a new method which can be used in the laboratory control of anti-corrosion water treatment. 8 references. VVK (13)

Report of Committee on Pipe Line Friction Coefficients and Effect of Age Thereon. ELSON T. KILLAM, CHAIRMAN. *J. New Eng. Water Works Assoc.,* Vol. 49, Sept. 1935, pp. 235-342. *J. Am. Water Works Assoc.,* Vol. 28, Sept. 1936, pp. 1293-1303. Section I gives a summary of the report, Section II a detailed discussion of coefficients for tar-coated cast-iron pipe and the effect of age and water quality upon coefficient values, and Section III to VIII data on various methods for reducing capacity loss. Other data on coefficient values for steel and concrete pipe, etc., are given in the Appendices. The general conclusions drawn are as follows: (1) Average actual loss in capacity of tar-coated cast-iron pipe after 30 yrs. of service, based on a total of 473 tests in 19 different systems, was 52%. The loss predicted in the Williams-Hazen Tables for mains of similar age and diam. (average 20.5 in.) and for "average soft unfiltered river water" is 32.3%. (2) Based upon the data available to the Committee, the Williams-Hazen age-coefficient relation is applicable primarily to large-diam. mains carrying relatively inactive water. (3) For small-diam. mains carrying active water, the actual loss after 30 yrs. may be twice the Williams-Hazen predicted loss. (4) Other factors being equal, the data show marked correlation between pH value of water carried and rate of capacity loss, average conditions reported indicating for supplies with a pH value of 6.5, twice the loss observed in supplies with a pH value of 8.0. VVK (13)

Corrosion and Fatigue in Wire Rope (Korrosion unter Ermüdung bei Drahtseilen) H. ALTPETER. *Glükauf,* Vol. 72, Oct. 3, 1936, pp. 1009-1010. General discussion. Under ordinary operation conditions, failure of wire rope results not from defective construction, overload, etc., but from dynamic bending stresses with consequent rapid corrosion. Testing methods are described, and the need for proper initial lubrication of the rope cord is emphasized. Strands must be well galvanized to protect them from attack. 10 references. Ha (13)

The Rehabilitation of Large Water Mains in Newark, New Jersey. WM. G. BANKS. *J. Am. Water Works Assoc.,* Vol. 28, Sept. 1936, pp. 1348-1369, discussion pp. 1369-1371. Description of the reconditioning of 50 miles of 32 to 46 yr. old riveted steel pipe lines, from 36 to 60 in. in diam. by cleaning and coating with bituminous enamel and cement. VVK (13)

Corrosion of Light and Extra Light Alloys by Marine Waters (Corrosione Marina delle Leghe Leggere e Ultraleggere) R. GUASTALLA. *Alluminio,* Vol. 5, Sept.-Oct. 1936, pp. 187-211. Original research. The corrosion of several light alloys by sea water was investigated; amount of corrosion after 150 days in sea-water was measured by the loss in weight. The following results were obtained:

	Average Composition				
Alloy	Al	Zn	Mn	Mg	Loss in weight
1) Elektron AM503 .	..	..	2%	remainder	4%
2) Elektron AZ 91 ..	10	..	0.3	remainder	37%
3) Elektron AM 61 .	6	..	1	remainder	41%
4) Elektron A Z G ..	6	3	0.20–0.5	remainder	53%
5) Elektron A Z F ..	4	3%	0.3	remainder	90%
6) Maxium	4	..	...	remainder	94%

All objects should be designed so as to avoid sharp angles, shoulders, etc., to reduce corrosion to a minimum. AWC (13)

Corrosion and Protection of Light Alloys. E. E. HALLS. *Metal Treatment,* Vol. 2, Autumn 1936, pp. 110-118. Salt spray exposure tests for 14 days on samples of Al and Al alloy sheet indicate that the materials may be arranged in the following descending order of corrosion resistance: pure Al, commercial Al, Mn-Al, Mg-Al, low Cu-Ni-Mg-Al, Si-Al, Duralumin, and 8-12% Cu-Al alloys. For protection against corrosion, the oxide skins may be built up by the chemical M.B.V. process by vat dipping or the application of a paste, or by the electrolytic Bengough (chromic acid), Alumilite (sulphuric acid), Eloxal (oxalic acid) or other anodizing processes. Working details and relative advantages of these methods are described, and the protection of Mg alloys is briefly discussed. JCC (13)

Laboratory Control of Protective Treatment of Steel Pipe Lines by the Bureau of Water Works and Supply of Los Angeles. HARRY HAYES. *J. Am. Water Works Assoc.,* Vol. 28, Sept. 1936, pp. 1372-1392. Description of the methods used by the Bureau of Water Works and Supply for selecting, testing, and applying the materials which it uses for the protection of its steel water mains against corrosion. VVK (13)

Electrochemical Ulcer of the Buccal Mucosa: Report of Case. NORMAN W. ROOME. *J. Am. Dental Assoc.,* Vol. 23, No. 9, Sept. 1936, pp. 1652-1653. This case represented a filling of Au in contact with a Cu alloy. Where the dissimilar metals were insulated from each other the ulcer healed but reappeared when contact was restored. Roome raises a question regarding the harmful effects of dissimilar metals when they are not in contact. OEH (13)

Study of the Corrosion by Dilute Sulphuric Acid of Cast Iron Containing Small Amounts of Copper (Etude de la Corrosion des Fontes à Faibles Teneurs en Cuivre par l'Acide Sulfurique dilué) JEAN R. MARÉCHAL. *Bull. Sci. Assoc. Élèves des Écoles Spéciales,* No. 4, Feb. 1937, pp. 168-173. Original research. Behavior of cast Fe in sulphuric acid was studied as a function of concentration and for irons containing 0, 0.15, 0.45, 1.16, 1.26 and 1.36% Cu. Curves obtained by plotting loss of weight in mg./mm.^{2}/day against H_2SO_4 concentration between 0 and 15% H_2SO_4 showed a maximum for each iron; as the Cu content increased the maximum occurred at higher H_2SO_4 concentrations. At any concentration the loss of weight decreased with increasing Cu content. With the wt.-loss curves of all the irons plotted on the same coordinates, the maxima were observed to fall along a continuous line. A "corrodibility maximum" coefficient (quotient of maximum weight loss and corresponding acid concentration) is suggested for indicating the relative resistance of Cu-bearing cast irons. FPP (13)

Preventing Corrosion. WM. SWALLOW. *Automobile Eng.,* Vol. 26, Oct., 1936, pp. 409-410. General review. Plating, paint films, oxide and similar films, and cementation are discussed. Ha (13)

14. APPLICATION OF METALS AND ALLOYS

Materials for Electrical Heating Apparatus (Werkstoffe für Elektrowärmegeräte) A. Thum & F. Meyercordt. *Elektrotechnische Zeitschrift,* Vol. 57, Oct. 1, 1936, pages 1135-1139. Most used materials are Ni-Cr alloys with or without Fe. 32 references. Ha (14)

Selection of Resistors for Electrical Heating (Auswahl der Werkstoffe für elektrische Wärmeerzeugung) W. Hessenbruch. *Elektrotechnische Zeitschrift,* Vol. 57, Oct. 1, 1936, page 1134. Composition and temperature limitations, in various atmospheres, of available materials are tabulated. Ha (14)

Aviation. George Gardner. *Iron Age,* Vol. 139, Jan. 7, 1937, pages 92-97. Discusses the application of various metals in aircraft construction. VSP (14)

All-metal "Mainliners" Set New Standards in Deluxe Air Travel. *Steel,* Vol. 100, Mar. 8, 1937, pp. 42-44. Describes construction of new planes of United Air Lines. Sheets and extruded shapes of Al alloy are used largely, with some stainless steel sheet. MS (14)

Hydrofluoric Acid. L. Church. *Chem. Trade J.,* Vol. 99, Aug. 14, 1936, pp. 125-126. From *Chem. & Met. Eng.,* Vol. 43, July 1936, pp. 366-368. Deals with handling and shipping. Includes consideration of use of Pb and steel containers. MS (14)

Trends in the Use of Copper, Lead, Zinc, Tin Graphically Detailed. *Eng. Mining J.,* Vol. 138, Feb. 1937, pp. 61-64. The trends in the use of these metals in the U. S. A. during the years 1929 to 1936 inclusive are plotted. WHB (14)

Weldless Steel Chains. Ian M. Smith. *Shipbuilder & Marine Eng. Bldr.,* Vol. 44, Feb. 1937, pp. 100-101. Practical. Lengths of chain, usually from 60 to 70', are produced directly from a bar of special section, which is passed through a special rolling mill to form the links on the bar. Weldless steel chain is approximately half the weight for equal strength of welded iron and is manufactured from 28 to 32 tons/in.^{2} mild steel. Weldless chains are also made in Mn steel, Ni steel, Monel metal, and the lighter alloys such as Duralumin. JWD (14)

14a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

Constructing Amalgam Fillings by Reinforcement to Approximate Strength of Cast Gold. F. A. Bull. *J. Am. Dental Assoc.,* Vol. 23, Sept. 1936, pp. 1655-1665. Original research, investigating reinforcing amalgams with Ag alloy bars much like concrete is reinforced with steel bars. In transverse tests using a specimen 1.5 x 1.5 x 15 mm. plain amalgam broke at a load of 3 lbs., while a specimen reinforced with a 90% Ag alloy of 1 mm. diam. broke at about 18 lbs. and a cast of 20-carat Au alloy at 21 lbs. The amalgam forms a strong bond with the Ag alloy and the reinforced amalgam will stretch in tension before breaking. In compression tests reinforced cylinder, 4 x 8 mm. withstood a pressure of 600 lbs. while plain amalgam withstood only 350 lbs. The introduction of Ag alloy reinforcing into amalgams decreases the Hg content, decreases flow and reduces expansion and contraction with changes in temperature. Actual inlays have been made and good results are reported. OEH (14a)

Railroads. Rogers A. Fiske. *Iron Age,* Vol. 139, Jan. 7, 1937, pages 82-90. Review of developments in 1936 affecting the steel industry. VSP (14a)

A New Alloy with a Melting Point of 48° C. (Neue Legierung mit dem Schmelzpunkt 48° C.) *Werkstoffe & Korrosion,* Vol. 11, Dec. 25, 1936, page 92. Alloy contains 50% Bi, 27% Pb, 13% Sn, 10% Cd, and a small amount of In is added. Ha (14a)

Lead Bronzes (Zur Frage der Blei-Bronzen). Willi Claus. *Metallwirtschaft,* Vol. 8, Jan. 29, 1937, pp. 109-114. Review, with description of practical applications, bringing up to date a previous paper published by the author in 1926. Use of Pb bronzes for thin steel backed bearings is emphasized. GA (14a)

Electrical Contacts. Edmund Downs. *Electrical Rev.,* Vol. 120, Jan. 29, 1937, pp. 168-169. Survey. Discusses use of precious metals for contact work, by virtue of their freedom from oxidation and corrosion at all temperatures, high melting-points, malleability, and ductility. Pure Ag is particularly suitable where transmission of large currents or rapid dissipation of heat is necessary. Sterling Ag is used where a cheaper and somewhat harder material is required to function under conditions where contacts undergo a wiping action when actual contact takes place. Small graphite block impregnated with an equal quantity of pure Ag powder is used for fixed contact where low resistance is required, as in low-voltage d.c. circuits. Material consisting of thin facing or inlay of Ag welded or soldered to Cu sheet or wire is widely used in comparatively large contact gear for transmission of heavy currents. Pt group metals and alloys, because of cost, are used only where conditions are unusually severe or unsuitable for any other material. Pt is most widely used and is found in telephone relay systems and other light-pressure, low-voltage work where current is slight and absolute immunity from oxidation or other non-conducting film is essential. Binary or ternary alloys of Pt with Ir, Os, Ru, or Rh are used for heavier work and where continuous arcing conditions make a heavier material desirable. 10-25% Ir-Pt alloy, welded to a steel base, is used for aeroplane and automobile magneto contacts. Pt group is also alloyed with Cu for special contact work. Pd-Cu alloy with 60% Pd finds much use for telegraph relays. MS (14a)

Developments in Bearings and Bearing Materials. A. B. Willi. *Products Engineering,* Vol. 8, Jan. 1937, pages 13-15. Improvements in types of precision sleeve bearings are reviewed. For very high pressures, (as high as 3300 lbs./sq. in.) in Diesel engines, Cd-Ag bearings were especially successful, as their melting point is above 135° F. higher than Sn-base babbitts, and they have a lower friction coefficient. Ha (14a)

Aluminum Furniture—How It Is Formed, Assembled and Finished. *Steel,* Vol. 99, Nov. 9, 1936, pages 48, 50, 53, 88-89. Describes practice of General Fireproofing Co., Youngstown, O., for manufacture of office chairs. MS (14a)

Hydrochloric Acid Handling. *Chemical Trade Journal and Chemical Engineer,* Vol. 99, Dec. 4, 1936, page 472. Deals briefly with use of Ni and Monel Metal for equipment coming in contact with HCl. Monel metal is slightly superior to pure Ni. Their usefulness is generally limited to service at atmospheric temperatures in solutions containing less than 20% acid. In hot solutions, limit is 2%. The lower the degree of aëration and agitation, the lower the rate of corrosion. MS (14a)

Building Construction; Architectural Uses of Aluminium. K. Sutter. *Times Trade and Eng.,* Vol. 40, Mar. 1937, pp. 27-28. Review of a number of applications. **Railway Rolling Stock; Vital Factor of Weight Reduction.** Ibid. P. 33. Discusses use of Al in construction of rolling-stock for various types of railroads. **Motor Vehicle Construction; Advantages of Light Metals.** Ibid. P. 46. Discusses use of Al and its alloys. MS (14a)

Amalgam Restorations. F. J. Viner. *J. Am. Dental Assoc.,* Vol. 23, Sept. 1936, pp. 1682-1689. General review of importance; describes good technique in making amalgam fillings. Good alloy should be used, amalgamation should be completed in the mortar using ample Hg, but the excess should be pressed out in condensing or placing the amalgam. OEH (14a)

Aluminum in Varnishes (L'Alluminio nelle vernici). Adelaide Labo. *Alluminio,* Vol. 6, Nov.-Dec. 1936, pp. 212-214. A summary of the use of Al in varnishes and in Al bronze. AWC (14a)

Raw Material Questions in the Valve Field (Rohstoff Fragen auf dem Armaturengebiet) W. Gebhardt (Berlin Tech. Comm. on Valves). *Arch. Wärmewirt.,* Vol. 18, Feb. 1937, pp. 39-42. Discussion. The new German laws forbid unnecessarily expensive alloys, types, and parts. Various substitutes for Cu and Ni in valves, their advantages and disadvantages, are reviewed. Although Cu and Ni may be used for valve seats at high temperatures, pressed materials should be used up to 90° C. and high alloy steels may replace Ni alloys in the range 225°-400° C. Considerable metal can be saved by making handles, etc., of wood or pressed materials. JZB (14a)

14b. Ferrous

M. GENSAMER, SECTION EDITOR

German Stainless Steel for Tableware. *Steel,* Vol. 99, Nov. 2, 1936, page 45. Note about "Roneusil," a steel containing 8-9% Cr and 12% Mn, but no Ni. It is ductile, has a silvery appearance, and is said to be rustproof and resistant to food acids. Principal use is tableware. Knife-blades must be made of another material, since "Roneusil" can not be hardened. It may be soldered or welded, latter requiring a special welding rod needing no flux. Heat treatment of joint is unnecessary. MS (14b)

Valve for Reversing Flow of Gases Is Made of Heat-resisting Alloy Steel. *Steel,* Vol. 99, Nov. 9, 1936, page 79. Describes reversing valve for open-hearth and heating furnaces and soaking-pits, in which Cr-Ni heat-resisting steel is used for gate and seat. Need for H_2O cooling is thus eliminated. MS (14b)

First Stainless Steel Commercial Plane Christened; Takes 1600 Pounds. *Steel,* Vol. 99, Oct. 5, 1936, page 19. Brief description of amphibian constructed by the "shotweld" process. Fuselage and wings are virtually a 1-piece unit. Ship is practically all stainless steel, except engine, wing fabric, control surface coverings, and minor parts. MS (14b)

Springs of Stainless Steel. SAM TOUR. *Iron Age,* Vol. 138, Oct. 15, 1936, pages 101-104, 106, 108, 110, 112. Gives results of tests on the use of cutlery grade of stainless steel for springs. Properly heat-treated stainless steel may be as tough or tougher than Cr-V spring steel. Includes a number of tables giving heat treatment, drawing temperatures, hardness and impact results of stainless steel specimens and impact hardness values for low-C cutlery steel. VSP (14b)

Steel Uses Grow. F. L. PRENTISS. *Iron Age,* Vol. 139, Jan. 7, 1937, pages 122-129. Review of new steels and new applications in 1936. VSP (14b)

Forged Versus Cast Crankshafts and Camshafts. R. E. W. HARRISON. *Heat Treating Forging,* Vol. 22, June 1936, pp. 290-291. Discussion of papers by W. F. Pioch *(Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 440L/5) and by D. J. Vail *(Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 553L/1). MS (14b)

Metallurgical Aspects of Transmission Gears. R. B. SCHENCK. *Steel,* Vol. 98, Feb. 17, 1936, pp. 32-36; Mar. 9, 1936, pp. 32-34. See *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 580R/1. MS (14b)

Modern Cast Irons in Chemical Plant Equipment. J. G. PEARCE. *Iron Steel Ind.,* Vol. 9, Sept. 1936, pp. 491-494. *Chem. Trade J.,* Vol. 99, Nov. 27, 1936, pp. 447-448. Discussion of the factors affecting the selection of cast Fe for chemical engineering applications. CEJ + MS (14b)

Tube Steels for Oil Production (Röhrenstähle für Erdölgewinnung) K. BISCHOFF. *Z. Ver. deut. Ing.,* Vol. 80, Oct. 31, 1936, pp. 1328-1329. Comprehensive review of available materials. Steels for piping and shafting of oil wells are Cr-Cu, Cr-Mo, Cr-Ni-Mo and Cu-Mn-Cr-Si steels with the alloying element below 2.5%. Creep-resistant materials used in the cracking processes at 250°-600° C. and under 20-80 atm. pressure, include C steels; Cu-Mo and Cr-Mo steels (1-1.5%); Cr steels with up to 8% Al, Si and Mo; highly alloyed ferritic Cr steels with up to 20% Al, Si, Mo; and high alloy austenitic Cr-Ni steels. The first 2 groups are used up to 400° C., the second and third up to 500° C., and the third, fourth and fifth for higher temperatures. Ha (14b)

Cast Cam and Crankshafts. H. CORNELIUS & F. BOLLENRATH. *Metal Treatment,* Vol. 2, Autumn 1936, pp. 125-129, 131; *Foundry Trade J.,* Vol. 55, Nov. 26, 1936, pp. 411-413. See *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 552R/9. JCC + AIK (14b)

New Type Sleeper Bus for Desert Travel. *Heat Treating Forging,* Vol. 23, Feb. 1937, pp. 70, 74. Light-weight bus is of stainless steel, constructed by the "shotweld" process. MS (14b)

The Resistances Developed by Steel Supports. L. J. BARRACLOUGH. *Proc. S. Wales Inst. Engrs.,* Vol. 52, July 24, 1936, pp. 121-147, 211-217. The use of steel props for roof supports in coal mines is discussed. AHE (14b)

15. GENERAL

Granite City Steel Company Maintains Traditions. CHARLES LONGENECKER. *Blast Furnace & Steel Plant,* Vol. 25, Jan. 1937, pp. 92-101, 129. Outlines history of company and describes plant and equipment at Granite City, Ill. Recent installation consists of a 90-in. continuous hot strip mill and a 48-in. 4-high cold strip mill. MS (15)

Review of Iron and Steel Literature for 1936. E. H. McCLELLAND. *Blast Furnace & Steel Plant,* Vol. 25, Jan. 1937, pp. 106-111. 20th annual classified list of the separately published books and pamphlets of the year, with a few of 1935 not available for inclusion in last year's list. Reprinted, with additions, by the Carnegie Library of Pittsburgh and may be obtained gratis. MS (15)

Circulating Unit Heaters Reduce Production Costs in Metal Plants. FRED MERISH. *Steel,* Vol. 100, Feb. 8, 1937, pp. 38-41. Descriptive. Devices for space heating and air circulation improve working conditions and efficiency and protect materials and equipment from rust. MS (15)

Lubrication in the Steel Plant. W. C. KERNAHAN. *Blast Furnace & Steel Plant,* Vol. 24, Dec. 1936, p. 1105; Vol. 25, Jan. 1937, p. 128. Good lubrication department and complete, accurate records of every important point of lubrication help to effect large savings in bearing and lubricant costs. MS (15)

Find Gray Iron Foundry Costs. D. C. KICKLER. *Foundry,* Vol. 65, Jan. 1937, pp. 54, 57. Discusses a set of comparatively simple forms whereby accurate check may be obtained in foundry costs. VSP (15)

Iron and Steel. A. B. KINZEL. *Mining and Met.,* Vol. 18, Jan. 1937, pp. 53-55. Review of current conditions. VSP (15)

Present Steelmaking Facilities Show Significant Weaknesses if Rush of New Business Continues. J. D. KNOX. *Steel,* Vol. 100, Jan. 4, 1937, pp. 109-116. Discusses steel-making capacity in relation to new finishing capacity, and outlines and tabulates 1936 completed and inaugurated construction programs of American Fe and steel companies. There is an imminent shortage of soaking-pit capacity. Large portion of present capacity is obsolete. It is likely that more coke-ovens, blast-furnaces, and open-hearth furnaces will be necessary. MS (15)

Rare Metals and Minerals. COLIN G. FINK. *Mining and* Met., Vol. 18, Jan. 1937, pp. 22-25. Outstanding in progress among less familiar metals during 1936 is the electrolytic production of 99.9% Mn; increased activity in rare metals and mineral field has been recorded due to renewed prosperity of major metals and vacuum tubes. Refers to data published during 1936 on: Sb, Gl, Cd, Cs, Rb, Ta, Cb, Ga, Ge, In, Co, Li, Mg, Mn, Hg, Po, Pt, Na, Ti, Zr, W, Se and Te. VSP (15)

15a. Economic

Copper, Lead, and Zinc Mining in 1936—Advance Summary. O. E KIESSLING. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 526, Feb. 6, 1937, 3 pp. Statistical. AHE (15a)

Metallurgy of Lead. CARLE R. HAYWARD. *Mining and Met.,* Vol. 18, Jan. 1937, p. 18. Survey of general conditions in Pb industry. A distinct improvement is noted. See *Metals and Alloys,* Vol. 6, Mar. 1935, p. MA 88L/5. VSP (15a)

Mine Production of Gold in the United States in 1936—Advance Summary. CHAS. W. HENDERSON. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 524, Feb. 5, 1937, 5 pp. Statistical. AHE (15a)

Silver Mining and Production in the United States in 1936—Advance Summary. CHAS. W. HENDERSON. *U. S. Bur. Mines Mineral Market Repts.,* No. M. M. S. 525, Feb. 5, 1937, 5 pp. Statistical. AHE (15a)

British Steel Industry Moves Up to Record Production. J. A. HORTON. *Steel,* Vol. 100, Jan. 4, 1937, pp. 368-370. Reviews conditions in Fe and steel industry in 1936. Includes statistics on average monthly production, imports, and exports for 1913, 1933—Oct. 1936. MS (15a)

Aluminum Industry in 1936—Advance Summary. Herbert A. Franke & C. T. Herring. *U. S. Bur. Mines, Mineral Market Repts.*, No. M. M. S. 527, Jan. 30, 1937, 2 pp. Statistical. AHE (15a)

Regional Surveys. *Eng. Mining J.*, Vol. 138, Feb. 1937, pp. 69-76, 80-87. **Canada,** John B. DeMille, pp. 69-72. **United States,** H. C. Chellson, pp. 73-75. **Mexico,** A. H. Hubbell, pp. 76-77. **Africa,** George L. Walker, pp. 80-81. **Australia,** Peter G. Tait, pp. 81-83. **Soviet Union,** H. C. Chellton, pp. 83-85. **Japan,** Burton Crane, p. 85. **The Philippines,** Ralph Keeler, p. 87. WHB (15a)

New Capacity. *Iron Age*, Vol. 139, Jan. 28, 1937, pp. 32-37. Survey. Steel industry spent over $200,000,000 in 1936 and will follow with an additional $175,000,000 to $225,000,000 in 1937, as individual units diversify their products, increase capacity and maintain a strong competitive position. Gives a detailed list of new construction for each company in the United States. VSP (15a)

European Market Summary. Vincent Delport. *Steel*, Vol. 100, Jan. 4, 1937, pp. 365-366. Brief review of Fe and steel markets in 1936. MS (15a)

World Steel Output Greatest in History; European Armament a Stimulus. Vincent Delport. *Steel*, Vol. 100, Jan. 4, 1937, pp. 332-333. Tabulates production of pig-Fe and steel ingots and castings in the different countries of the world, 1927-1936; exports and imports of the principal countries, 1913, 1933-1936; and per capita consumption of steel in 1936. MS (15a)

Hand in Glove with Your Progress. Walter S. Doxsey. *Fab. Progress*, Dec. 1936, pp. 136-137. Review of steel warehousing problems and modern solutions thereto. WB (15a)

Mine Production of Gold, Silver, Copper, Lead and Zinc in the Eastern and Central States, 1935—Final Summary. J. P. Dunlop. *U. S. Bur. Mines, Mineral Market Repts.*, No. M. M. S. 497, Nov. 24, 1936, 6 pp. Statistical. AHE (15a)

Raw Materials. *Steel*, Vol. 100, Jan. 4, 1937, pp. 318, 320-321, 427-429. Deals with supplies of scrap, Fe-ore, coke, and ferroalloys. Includes statistics. MS (15a)

Pig Iron Production, 1887-1937. *Steel*, Vol. 100, Jan. 4, 1937, p. 362. Statistics on United States annual production for 1887-1916, and total monthly and average daily production for 1917-1936. MS (15a)

Steel Ingot Production, 1917-1937. *Steel*, Vol. 100, Jan. 4, 1937, p. 360. Statistics on United States total monthly and average daily production, compiled by American Iron and Steel Institute. MS (15a)

Domestic Market Summary and Price History. *Steel*, Vol. 100, Jan. 4, 1937, pp. 340-342, 345-358, 411. Review of American Fe and steel markets in 1936, and tabulation of monthly price averages for 1927-1936 of ores, ferroalloys, pig-Fe, semifinished material, coke, scrap, and finished material. MS (15a)

Distribution of Alloy Steel Shows Broader Use by Railroads, Machinery Industries. *Steel*, Vol. 100, Jan. 4, 1937, p. 338. Tabulates United States consumption in gross tons by groups and by finished products for 1936, and annual % of consumption for 1929-1936. MS (15a)

Belgo-Luxemburg Obstacles Gradually in Eclipse. *Steel*, Vol. 100, Jan. 4, 1937, pp. 375-376. Survey of conditions in Fe and steel industry during 1936. Gives statistics on average monthly production, imports, and exports for 1913, 1933-Oct. 1936. MS (15a)

Auto Industry Leads in Steel Consumption in 1936; Railroads Gain Sharply. *Steel*, Vol. 100, Jan. 4, 1937, pp. 334-337. Tabulates annual consumption ratios of main groups in the United States for 1922-1936, and distribution of various finished steel products in % and in gross tons to consuming groups for 1936. MS (15a)

Nationalist Policies Sweep German Plants to New Peak. *Steel*, Vol. 100, Jan. 4, 1937, pp. 373-375. Review of Fe and steel industry during 1936. Includes statistics on average monthly production, imports, and exports for 1913, 1933-Oct. 1936. MS (15a)

Steel Production Swings Upward in 1936. *Blast Furnace & Steel Plant*, Vol. 25, Jan. 1937, pp. 69-70. Statistics on pig-Fe and steel ingot production for 1935-1936. MS (15a)

15b. Historical

Development of the Magnesium Industry. James Rubinfield. *Chem. Eng. Mining Rev.*, Vol. 29, Jan. 8, 1937, pp. 153-154. A general review. WHB (15b)

Mining in Canada During 1936. W. H. Losee. *Can. Mining J.*, Vol. 58, Feb. 1937, pp. 58-64. A review. Canadian mineral production reached an all-time high in 1936. WHB (15b)

The Philippine Mining Industry. Ralph Keeler. *Can. Mining J.*, Vol. 58, Mar. 1937, pp. 123-127. Historical review. The inauguration of the Commonwealth has resulted in activity in the mining operations, mostly on Au, though Cu, Mn and Cr are being shipped out of the country. WHB (15b)

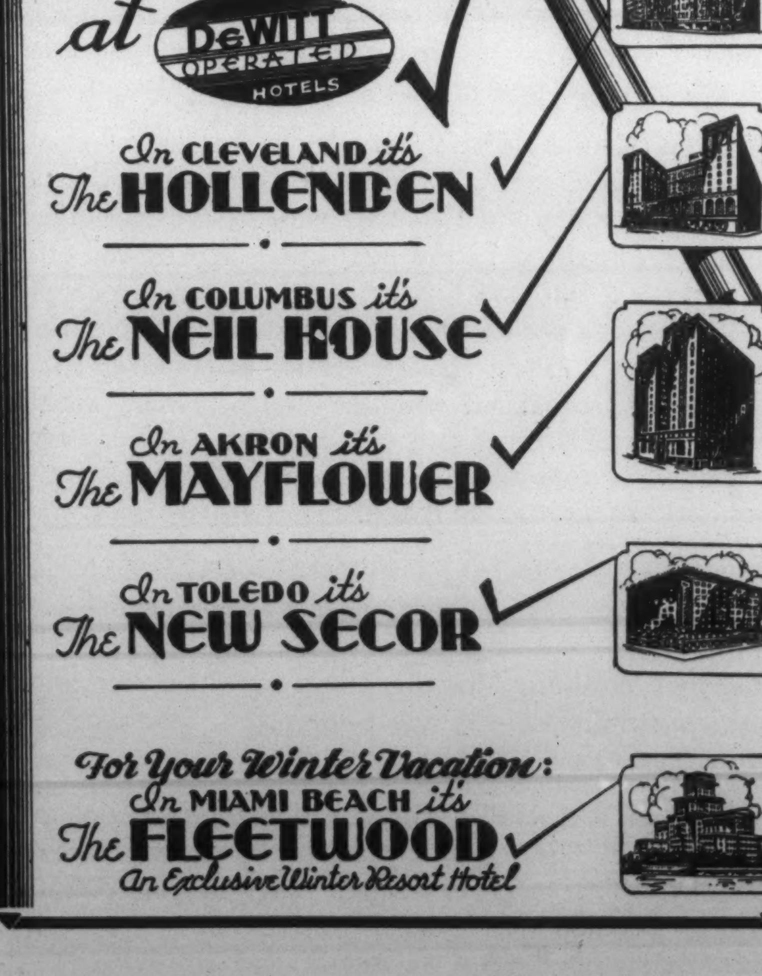
Wiluna Ore Treatment Difficult. C. E. Prior. *Chem. Eng. Mining Rev.*, Vol. 29, Feb. 8, 1937, pp. 201-202. Historical review of metallurgical progress since operations started in this mine. WHB (15b)

Mining in Nova Scotia During 1936. Michael Dwyer. *Can. Mining J.*, Vol. 58, Feb. 1937, pp. 97-99. Coal production was very satisfactory and the production of Au and gypsum was high. WHB (15b)

Mining in Manitoba During 1936. J. P. deWet. *Can. Mining J.*, Vol. 58, Feb. 1937, pp. 79-86. A review. Cd is now among the metals produced in Manitoba. Activities at the various mines of the province are outlined. WHB (15b)

Rise of a New Industry; Coming of Aluminium. Arthur Vining Davis (Aluminum Co. of Amer.) *Times Trade and Eng.*, Vol. 40, Mar. 1937, pp 1-2. Historical. MS (15b)

Mining in North-Western Quebec During 1936. A. G. Bridger. *Can. Mining J.*, Vol. 58, Feb. 1937, pp. 88-93. A review. Increase of Au production over the 1935 production was 41%. An outline is given of the progress and developments during 1936. WHB (15b)



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Book Reviews

THE CORROSION OF METALLIC MATERIALS. VOL. I. CORROSION OF IRON AND ITS ALLOYS.

(Die Korrosion Metallischer Werkstoffe. Band I. Korrosion des Eisens und seiner Legierungen)

G. Masing, E. H. Schulz, C. Carius, K. Daeves, E. Houdremont and H. Schottky

Edited by Oswald Bauer, Otto Kroehnke and G. Masing

S. Hirzel Verlag, Leipzig, 1936. Paper, 7 x 10 in., 560 pages. Price 37.50 RM.

This is the first volume of what promises to be a monumental work. It includes a general theoretical discussion and then the corrosion of iron and its alloys. Three more volumes are in preparation. The second will cover the corrosion of non-ferrous metals; the third, protection against corrosion; and the fourth, practical applications. This volume represents a cross section of the knowledge and experience of men very active in their respective fields and is divided as follows: *The Theory of Corrosion* by G. Masing, 123 pages; *Corrosion of Iron* by C. Carius and E. H. Schulz, 280 pages; *Steel with Enhanced Resistance to Corrosion* by K. Daeves, 21 pages; and *Acid- and Heat-Resistant Iron Alloys* by E. Houdremont and H. Schottky, 99 pages. The work is well and logically arranged. After a general theoretical discussion which covers in considerable detail corrosion of metals in electrolytes and attack of metallic materials in gases, the particular case of iron is considered. This section is written from the view point of the physical chemist and is not easy reading for the non-technical individual. However, a chemical process as complicated as corrosion, requires a thorough understanding of chemistry, physical chemistry, electro-chemistry, etc. if a real fundamental knowledge is desired. This remark applies more to the general discussion, as the discussion of iron should offer no difficulty to the non-technical individual. The influence of other elements, of the production process, of working and heat treatment and of the surface condition is then taken up. Many data on specific organic and inorganic substances are included. It is remarkable that the classic work of Heyn and Bauer in 1908 and 1910 still forms the bulk, in some cases the only, comprehensive data on corrosion of iron in certain chemicals over a wide range of concentration. Their work on potentials is also freely quoted. Corrosion fatigue and caustic embrittlement are adequately treated, considerable data being presented from the work of McAdam and Parr and Straub. Incidentally, throughout the book the authors have drawn freely on American and English work. A separate section, *Steels with Enhanced Resistance to Corrosion* by K. Daeves, takes up wrought iron, open-hearth iron, copper steel and copper-chromium steel. In the section on *Acid- and Heat-Resistant Iron Alloys* by E. Houdremont and H. Schottky data are included on the iron-chromium, iron-nickel, iron-nickel-chromium and iron-silicon alloys. Alloys cannot be considered from the standpoint of corrosion resistance alone. Their cost, their higher physical properties and their susceptibility to heat treatment require a careful study of the conditions under which they are to be used and of the properties of the particular alloy selected. The authors have taken up first the equilibrium diagrams, then their heat treatment and physical properties and finally their corrosion properties. As a whole the book is a very real contribution to corrosion literature. It is clearly and interestingly written and contains a wealth of information.—V. V. KENDALL

VANADIUM STEELS AND IRONS

Vanadium Corporation of America, New York, 1937. Leatherette, 6x9 in., 189 pages. Price $1.25; free if requested by executives or engineers on their business letterheads.

This is another of the interesting series of alloy steel handbooks put out for sales reasons but which get down to brass tacks and state demonstrable facts and quantitative data rather than trade name propaganda. These are coming from the steel producers, recent examples being "Bethelhem Alloy Steels" and Palmer's "Tool Steels Simplified", and from the alloy producers, with "Nickel Alloy Steels" and this book as the most recent ones. The alloy people's books, especially this one, bring in much information on steels not in quantity production, so that it is harder to pick out what, besides the regular S.A.E. series, may be easily procured, and they candidly put the best foot forward for the alloy of their subject. However, the data set forth are necessarily accurate, and such books are, therefore, among our most useful sources of information, even though they do not point out what substitutions can be made to secure the properties of the complex steels in which the alloying element under discussion enters, nor do they make it very clear how little of the element may be used and still secure a worth-while measure of the properties conferred.

This book is written for metallurgists, who nowadays need no special proof of the benefits, for many purposes, of fine grain size. The keynote of the book is the grain size control possible with vanadium, coupled with the special properties of the carbide, and supplemented by the enhanced depth-hardening properties produced when the carbide is taken into solution and the range of slow grain coarsening is entered. The value of V in steels for normalizing is, of course, stressed.

The chapters deal with the function of V, wrought V steels for light sections, for heavy sections, spring steels, cast steels, tool steels, nitriding steels, and cast irons.

Two dozen S.A.E. type curves show for various tempering temperatures tensile, yield, elongation, reduction, Izod, and Brinell Rockwell and scleroscope hardness for as many steels. Since V may enter practically every type of steel these give much data of interest and value to one seeking information on other alloying elements as well. The plots are packed full of data but with so many curves all drawn as solid lines they are hard for the eye to follow. This is especially bad in the cases where both 1" and 0.55" specimens were studied and the curves overlap for a small range of tempering temperatures.

The influence of V in both wrought and cast steels has been quite fully discussed in many publications; so these sections, while more conveniently assembled than most summaries, do not bring out much that is very new. The use of V in cast iron is of much more recent date and that chapter has much of special interest. The properties of an iron with 1½-2% Cu plus V are worthy of note.

The only previous attempt at such a summary of vanadium steels was published three years ago in Germany by Hougardy. The present volume is far more complete.

The book is clearly written, finely printed, and should be on the shelves of every metallurgist. We're going to be pretty careful about lending our copy for fear we might not get it back.

If it be propaganda, it is propaganda of the highest and most effective type.—H. W. GILLETT.

STAMPING TECHNIQUE, IV *(Stanztechnik, Teil IV; Werkstattbücher, Heft 60)*

W. Sellin.

Julius Springer Verlag, Berlin, 1937. Paper, 6 x 9 in., 65 pages. Price 2 RM.

This is the 4th section of the work of this title; the first three sections, of which only two have so far appeared, are by E. Krabbe. This section deals with press-forming, i.e., the bending, crimping, seaming beading, etc., of pieces which have been punched in a previous operation. Analogous forming of wire (including upsetting), the riveting or similar mechanical joining of pieces, embossing, etc., are also briefly discussed.

By means of diagrammatic sketches, the sequence of operations required in forming peculiar shaped gadgets, bent and formed in several planes, is clearly shown. The way a hinge is rolled up is one of the simpler operations thus depicted.

The equipment shown is mainly that for hand-feed rather than for automatic feed, but the principles of die design and arrangement are applicable to both.

The ability of various formable metals and alloys to be deformed is briefly discussed, but not from the metallurgical point of view. —H. W. GILLETT.

PICKLING OF METALS AND ALLOYS *(Le Decapage des Metaux et Alliages)*

G. de Lattre

Dunod, Paris, 1937. Paper, 6½ x 10 in., 189 pages. Price 43 francs.

The effects of concentration, time, temperature, circulation, Fe content of bath, and C content of steel, on the rate of solution of steel in H_2SO_4 are shown in curves or tables. The solubility relations of Fe_2SO_4 and H_2SO_4 are similarly shown. Methods for separating Fe_2SO_4 by crystallization are discussed, mechanical means for agitating the bath and moving the work are shown and chemical control methods given. HCl pickling is briefly discussed along similar lines. A few generalities are given on pickling stainless and cast iron. The pickling of Cu by H_2SO_4, followed by HNO_3-NaCl, that of brass by HNO_3-H_2SO_4-NaCl or by $ZnCl_2 2NH_4Cl$, and of Al by the various reagents used by Work, are commented upon. Degreasing as a preliminary to pickling, and the use of inhibitors come in for a little comment. Several commercial inhibitors whose trade names are given, are compared as to efficiency, but no information is given as to their composition.

Only chemical pickling is discussed. It is stated that various electrolytic methods are in use for pickling before plating, but they are not described. Nothing is said about the problems of continuous pickling of wire or strip. The book puts on record some rather well known facts and hence is useful. Practically no information is given on recent American developments in pickling practice under high production conditions, while that in respect to tough jobs like pickling stainless is extremely scanty. However, the volume serves as an introduction to the general subject.—H. W. GILLETT.

CORROSION AND FATIGUE *(Korrosion und Dauerfestigkeit) Mitt. Material-prufunganstalt Tech. Hochschule, Darmstadt, No. 9*

A. Thum and H. Ochs

VDI-Verlag, Berlin, 1937. Paper, 6 x 8½ in., 107 pages, 65 figs., 34 tables, 139 references.

This summarizes the problem of corrosion-fatigue, assembling tables of composition, static properties, endurance limit and corrosion-fatigue on both ferrous and non-ferrous alloys whose corrosion-fatigue behavior has been reported in the literature. Some 120 sets of data for carbon and alloy steels, a few on steel castings and cast iron, some 50 on Cu alloys and 35 on light alloys, are included.

Photographs of fractures and micrographs of corrosion pits and cracks starting therefrom show the mechanism involved. Metallic coatings, nitriding, addition of inhibitors to the corroding medium, work hardening and polishing of the surface are all discussed in reference to corrosion-fatigue. In connection with corrosion pits, the effect of notches is brought out.

Outside of plating with Zn or Cd when such coatings are protective against the corrosive environment, or the use of high Cr alloys when they do the job, mitigation or avoidance of corrosion-fatigue is not easy to accomplish, so that careful engineering thought has to be given to each case to find an answer that is not more expensive than replacement.

While the pamphlet naturally includes much data from McAdam, the bulk of the information cited is from German sources. The important problem of corrosion-fatigue in oil-well sucker rods, on which there is some American literature, has not been touched upon in this compilation. On the whole, however, it is a quite complete and decidedly useful source of information—H. W. GILLETT.

WHAT IS STEEL? *(Was ist Stahl?)*

Leopold Scheer

Julius Springer Verlag, Berlin, 1937. Paper, 5½x8½ in., 91 pages. Price 2.70 RM.

As stated in the preface, this book was written as a textbook particularly for steel salesmen. In accordance with this purpose, cast iron and the manufacture of steel are not included. Within this small book is given a clear concise general view of steel metallurgy, including the iron-carbon diagram, its relation to heat treatment and structure, the effect of various elements on steel, corrosion resisting, and high speed steels. This is to be recommended as interesting and instructive reading for any person not technically trained.—J. Z. BRIGGS.

LEGAL AND ETHICAL PHASES OF ENGINEERING

C. F. Harding and D. T. Canfield

McGraw-Hill Book Co., New York, 1936. Cloth 6¼x9¼ in., 413 pages. Price $4.00.

Recently we have heard much comment and not a little real agitation concerning the danger, both to the individual and to society, of excessive technical specialization during collegiate training of our young engineers. In general, educators have been charged with cramming the student's mind with so many technical details (formulas, figures, facts) that he has no opportunity to prepare himself for the social, human relations, personal or professional problems that will be so large a part of his subsequent career in industry.

Much of this "viewing with alarm" is well founded, and it will be to provide the required broadening that many such books as this will probably be written in the next few years. This particular volume seeks to acquaint the young engineer with relevant principles of contracts, patent law, public relations, professional ethics, specification writing, etc. The section on patent law, which is the most useful to metallurgists, presents briefly and interestingly all the details of procedure, rights and litigation that the research or development engineer needs to know, and appears to be entirely accurate. Other phases of the law, however, are not covered with as much clarity, and seem to lack the stamp of authority that such sections should have if the engineer is to read them with confidence. The section on specifications could well have been omitted, as it consists largely of sample forms given in minutest details, which obviously made tedious reading and certainly would not be followed on any given job. A long appendix consisting of extracts from Indiana statutes on contracts, negotiable instruments and workmen's compensation, and 87 additional pages of sample specifications will probably also seldom be used by either the teacher or the practicing engineer.

The purpose of this book is ideal, and we are heartily in accord with it, but because of the large amount of potentially useless material included in its pages, the book itself cannot be recommended for general use.—FRED P. PETERS.

CONDENSED HANDBOOK OF ALL ALLOYS

(Kurzgefasstes Handbuch aller) Legierungen)

E. Jaenecke

O. Spamer, Leipzig, 1937. Paper, 6¾ x 9½ in., 493 pages, 800 diagrams. Price 52 RM.

This is a pretentious title, but the "all alloys" part is justified. The "handbook" part is a misnomer, since the book deals only with equilibrium diagrams, not with properties.

When one is moved to build up an unusual alloy in the hope of securing specific desired properties, he wants to know, always for technical reasons, and sometimes for patent reasons, what, if anything, has been done with that alloy before. The most basic information, and that first sought, is the equilibrium diagram for the alloy series in question. It requires an extremely extensive library, and a well-indexed one, to find out whether or not the information wanted is in existence, to say nothing of the time required to make the search. The collection of all the equilibrium diagrams available to date, with references to the original literature, is a great convenience, provided the job is thoroughly done. Hansen (Der Aufbau der Zweistofflegierungen, 1936) did this for binary alloys, but a good modern compilation on the more complex alloys has been lacking. The need is supplied by Jänecke, for half of this book is devoted to ternary alloys and their solid diagrams. A few quaternary systems are depicted as far as this can be done, but beyond that solid geometry fails. A section headed "Something about a four dimensional representation of quintenary alloys" closes with the comment that this is really complicated.

The information given is presented in moderate space by the profuse use of diagrams. The diagrams are grouped by phase-rule types, since some coordination is required to give a logical arrangement. The indexing is not as profuse as it might have been, and one must glance through the table of contents in the front to be sure whether what he is looking for is there, since the index in the back covers only the 193 ternary systems described.

This is the sort of book that the reader may take from the shelf only once in six months, but when he does want it, he wants it badly. It is recommended for reference purposes, and is equally useful to ferrous and non-ferrous metallurgists.—H. W. GILLETT.

CORROSION V *(Korrosion V)*

VDI Verlag G. m. b. H., Berlin, 1935. Paper, 120 pages. Price 7.50 RM.

A symposium on corrosion conducted under the auspices of the Deutsche Gesellschaft für Metallkunde, Deutscher Verein von Gas- und Wasserfachmännern, Verein Deutscher Chemiker (with Dechema, Deutsche Gesellschaft für chemisches Apparatewesen und Reichsausschuss für Metallschutz), Verein deutscher Eisenhüttenleute und Verein deutscher Ingenieure.

Section I (Introduction and General Problems of Corrosion) includes the following chapters: *Chemical Investigations in Corrosion Research (Chemische Arbeit in der Korrosionsforschung)* PAUL DUDEN. Pages 3-6. *Fundamentals of the Theory of Metal Corrosion (Grundlagen der Theorie der Metallkorrosion)* W. J. MÜLLER. Pages 6-9. From a review of previous work and his own experiments, the author states that the corrosive behavior of a metal is dependent on the characteristics of the surface film. If the surface area free of film is of the order of 10^{-4} cm^2/cm^2 the metal is passive and will not corrode. If this area is greater than 10^{-3} cm^2/cm^2 the metal will corrode. 8 references. *An Accelerated Testing Method for Corrosion Investigations (Eine Schnellprüfungsmethode bei Korrosionsuntersuchungen)* W. PALMAER. Pages 10-16. Abstract of paper in *Korrosion und Metallschutz,* Vol. 12, pages 139-148, 1936. See *Metals and Alloys,* Vol. 7, Dec., 1936, page MA609L/5. *Topochemical Structure in Corrosion Phenomena (Topochemische Züge in den Korrosionserscheinungen)* V. KOHLSCHUTTER. Abstract of paper in *Korrosion und Metallschutz,* Vol. 12, pages 118-123, 1936. See *Metals and Alloys,* Vol. 7, Dec., 1936, page MA610L/8. *Standardization of Corrosion Data and Corrosion Investigations (Die Normung von Korrosionsangaben und Korrosionsversuchen)* F. TÖDT. Pages 26-30, discussion pages 31-33. The author advocates that g/m^2/day be used for expressing uniform loss in weight. Thickness of metal removed in mm/day is obtained by dividing g/m^2/day by 1000 x specific gravity of metal. General directions for recording corrosion data are given.

Section II (Cold Water Corrosion) includes: *Corrosion of Metallic Materials in Water Works Systems (Korrosion der metallischen Werkstoffe im Betriebe der Wasserwerke)* G. WIEGAND. Pages 35-40, discussion 40-41. Condensation of section from Vom Wasser, Vol. 10, page 142, Verlag Chemie, Berlin, 1936. See *Metals and Alloys,* Vol. 7, Oct., 1936, page MA509L/1. *Corrosion by Industrial Waste Water and Its Prevention (Korrosionsschäden durch industrielle Abwässer und ihre Verhütung)* H. STOOFF. Pages 41-47, discussion pages 47-48. Condensation of section from Vom Wasser, Vol. 10, page 129. *Influence of Continuous and Alternate Immersion in Seawater on the Corrosion of Steel (Einfluss der Dauer- und Wechselbenetzung von Seewasser auf die Korrosion von Stahl)* F. EISENSTECKEN & E. KESTING. Pages 48-60, discussion 60-61. In alternate immersion corrosion testing in sea water, it was found that the time of immersion in the sea water relative to drying time in air was of considerable importance in the rate of attack obtained. A clever utilization of electromagnets with a timing clock for regulating time of immersion is described. *Localized Corrosion of Iron and Steel in Dilute, Aqueous Salt Solutions (Ueber ortliche Korrosionen von Eisen und Stahl in verdünnten, wasserigen, Salzlösungen)* C. CARIUS. Pages 61-71, discussion 71-72. A study of localized and contact corrosion.

Section III (Prevention of Corrosion) include: *Corrosion Protective Film Formation in Cold Water Pipes of Cast Iron (Korrosion und Schutzschichtbildung bei Kaltwasserleitungen aus Gusseisen)* L. W. HAASE. Pages 73-77. Condensation of section from Vom Wasser, Vol. 10, page 186. *Recent Investigations on Deacidification of Tap Water (Neuere Erfahrungen über Entsäuerung von Leitungswasser)* E. NAUMANN. Pages 78-79. Condensation of article in Gas- und Wasserfach, Vol. 79, pages 161-166, 1936. *Underwater Protection in Sea Water (Unterwasserschutz im Seewasser)* C. BAERENFÄNGER. Pages 80-83. Ferrous materials and cement when exposed to sea water should be coated with tar or bitumen. Phenol-formaldehyde resins are not resistant to sea water. Benzylcellulose, synthetic resins and chlorinated rubber are unchanged in sea water. However, they as well as metals, become covered with marine growths. Systematic investigation of means of inhibiting marine growths is only possible when conducted with a knowledge of the living conditions of the organisms. *Evaluation and Applications of Bituminous Coatings (Auswahl und Anwendungsformen bituminöser Anstrichmittel)* K. WALTHER. Pages 83-92, discussion pages 92-94. Most corrosion resistant paints are based on bitumen, pitch from blown bitumen and high vacuum bitumen and coal tar pitch. All of these paints fail because of swelling when exposed to water. The water and weather resistance of coal tar pitch is better than bitumen. Examples are given. *Experience With Chlorinated Rubber Coatings (Erfahrungen mit Chlorkautschukanstrichen)* SCHULZE. Pages 94-98, discussion pages 98-99. Chlorinated rubber paints have been found very resistant to a large number of media. Applications are given. *Corrosion Experiments on Pure Aluminum and Aluminum Alloys (Ueber Korrosionsversuche an Reinaluminium und Aluminiumlegierungen)* E. ZURBRUGG. Pages 100-108, discussion pages 108-110. Pure Al and Al alloys (Al-Cu-Mg; Al-Mg-Si; Al-Mg-Mn; Al-Mn) were tested for corrosion resistance in distilled water, tap water, 3% NaCl and artificial sea water. Tensile strength and elongation decreased considerably when carbon dioxide was present. *Corrosion Resistance of Hydronalium, Especially Against Seawater (Ueber die Korrosionsfestigkeit von Hydronalium, insbesondere gegen Seewasser)* G. SIEBEL. Pages 110-113, discussion 114-116. Condensation of article in Aluminium, Vol. 17, page 562, 1935. See *Metals and Alloys,* Vol. 7, July 1936, page MA 372 R/1. *Summary and Outlook (Zusammenfassung und Ausblick)* F. TÖDT. Pages 116-120.—V. V. KENDALL.

CORROSION, VI *(Korrosion VI)* Symposium on Corrosion and Corrosion-protection, Cologne, Oct. 22, 1936.

VDI-Verlag, Berlin, 1937. Paper, 5¼ x 8¼ in., 61 pages. Price 5 RM.

Collection of 7 papers presented at an annual symposium of 6 German technical societies. The first discusses constructional details of railway cars, with emphasis on welding instead of riveting, since corrosion is accentuated about rivet-heads. Trucks and buses are next taken up, with a good word said for Al alloys in place of steel. Chemical apparatus is discussed, with comment on rubber linings, heat and corrosion-resistant alloys, coatings of synthetic plastics, and electrochemical protection. Interior and exterior corrosion of gas-pipes is the subject of the next paper. Corrosion of wire ropes and cables is prevented by proper lubrication or, where feasible, by galvanized zinc coatings, the latter sometimes covered with lead to combat SO_3, according to the next paper. Protection of structural steel in bridges and the like, is briefly mentioned, with welding again suggested instead of riveting. The same suggestion is made in regard to ship construction. Brief comment is made on cavitation erosion of propellers.

The articles, in general, deal chiefly with generalities, due to the restriction of time in presentation of papers at such a meeting, but they will interest those concerned with avoidance of corrosion in the field studied.—H. W. GILLETT.

Metal Statistics, 1937

Published by the American Metal Market, New York. Cloth 6¼ x 4 in. 592 pages. Price $2.

The annual appearance of this book is always welcomed. Besides being a collection of useful and informative data on economic subjects, this handy, coat-pocket sized book furnishes in its usual complete and compact form a record of production, consumption, imports, exports, stocks, price fluctuations (monthly and annual), data on various brands, analyses, trade terms, custom duties, etc., applying to finished and semi-finished ferrous and non-ferrous metal products as well as raw materials.

On page 3 of the Preface, attention is called to a number of additions and alterations incorporated in the metals section of this year's edition.—E. F. CONE.

Manufacturers' Literature

Testing Machines

The Southwark-Emery line of testing equipment is featured in a fully illustrated bulletin, containing charts, curves and technical data. Baldwin-Southwark Corp., Philadelphia, Pa. (B 914)

Automatic Optical Pyrometer

Bulletin No. 91-1 is devoted to the Optimatic sighting tube, the power supply unit and the instruments which comprise the Optimatic System for measuring surface temperatures of hot bodies in motion or at rest. The Brown Instrument Co., Philadelphia, Pa. (B 915)

Buffs and Compositions

Bulletin No. BC-104 contains pictures of the various types of buffs and compositions as well as a description of their uses. Hanson-Van Winkle-Munning Co., Matawan, N. J. (B 916)

Ampco Metal

Engineering Data Sheet No. 41 discusses hardness of metals. Ampco Metal, Inc., Milwaukee, Wis. (B 917)

Ground Shafting

Turned, ground and polished shafting and small diameter drawn, ground and polished bars are discussed in a leaflet illustrating the modern production methods used in manufacturing them. Bliss & Laughlin, Inc., Harvey, Ill. (B 918)

Optical Aids in the Metal Working Industries

Catalog D-22 is devoted to the above and contains descriptions, illustrations and specifications. Bausch & Lomb Optical Co., Rochester, N. Y. (B 919)

Retorts for Gas Carburizing

Rotary and stationary retorts are discussed in a leaflet which gives different analyses which may be used for varying conditions. The Calorizing Co., Pittsburgh, Pa. (B 920)

Spring Making

A handbook of modern spring engineering for users and designers of springs, containing useful data as well as illustrations, diagrams and engineering tables, has been issued by Barnes-Gibson-Raymond, Detroit, Mich. (B 921)

Air Drawing

It is claimed that this company's air drawing furnaces produce uniform Brinell hardness and grain structure. Diagrams and description. General Combustion Corp., Chicago, Ill. (B 922)

Testing Machine

This machine, for tensile, transverse and compression testing (capacity 30,000 lbs.) is the subject of a leaflet of the Detroit Testing Machine Co., Detroit, Mich. (B 923)

Adachrome

This plastic chrome cement, claimed to hold its component materials in suspension indefinitely, is described in a pamphlet. Botfield Refractories Co., Philadelphia, Pa. (B 924)

Hy-Speed Case

It is claimed that this case has a sufficiently low melting point so that it can be used from 900 to 1100° F. on high speed tools. A. F. Holden Co., New Haven, Conn. (B 925)

Steel in Forged Sections

Hardness conversion tables and tensile property tables are included in this catalog which also gives specific effects of alloying elements in steel. Heppenstall Co., Pittsburgh, Pa. (B 926)

Corrosion and Heat-Resisting Steels

Enduro Types HCN, NC-3 and HC are described in a leaflet containing analyses, physical properties, instructions for working and applications. Republic Steel Corp., Massillon, O. (B 927)

Insulating Brick

Physical properties of the new JM-20 insulating brick, designed for use behind refractory walls in furnaces are given in a leaflet featuring a table of heat losses transmitted through fire brick walls bare and insulated with JM-20 brick. Johns-Manville, New York, N. Y. (B 928)

Ladle Fluxes

The advantages of using fluxes for aluminum, brass, bronze, copper, nickel, iron and special alloys are listed. The Maluminum Co., Indianapolis, Ind. (B 929)

Zinc Alloy Die Castings

This supplement of "A Visual Report of Progress" brings the progress being made in the die casting industry up to date. The New Jersey Zinc Co., New York, N. Y. (B 930)

Thermalloy Castings

Information on Ni-Cr castings for heat and corrosion resistance which are X-ray inspected is given in a bulletin of the Electric Alloys Co., Elyria, O. (B 931)

Automatic Oil Burners

Bulletin 23 A describes advantages, installation and operation of Ryan Type DI automatic oil burners and shows some interesting metallurgical applications. R-S Products Corp., Philadelphia, Pa. (B 932)

Carbide Tools and Blanks

Catalog M-37 gives complete data on sizes and prices of Carboloy blanks, and specifications and prices of Carboloy standard completely-ground and unground tools. Carboloy Co., Inc., Detroit, Mich. (B 933)

Handling Heat

Alundum and Crystolon refractories for furnace and kiln linings and parts resist spalling, warpage, deformation under load and are of uniform dimensions according to publication No. 5 of the Norton Company, Worcester, Mass. (B 934)

Foundry Economy

Economical production of high quality metal is one of the advantages claimed for the use of the Brackelsberg rotating furnace, Whiting cradle furnace, pulverized coal equipment and other foundry aids in Bulletin 218. Whiting Corp., Harvey, Ill. (B 935)

Savings with Insulating Cement

Leaflet lists savings, advantages and applications of Sonittep Insulating Cement for furnaces and boilers. George F. Pettinos, Inc., Philadelphia, Pa. (B 936)

Die Casting Equipment and Alloys

Described as the complete die casting service, the products of Madison-Kipp Corp., Madison, Wisconsin, are presented in a bulletin covering lubricators, die castings and dies, designs and casting machines therefor, and Kipp Air Tools. (B 937)

Dehumidifiers

Lectrodryer systems, employing Activated Alumina for drying air and other gases by adsorption, are described in this well illustrated booklet by the Pittsburgh Lectrodryer Corp., Pittsburgh, Pa. (B 938)

Metallographic Polishing Machines

Direct drive (no belt or friction drive) polishing machines are described as providing operating smoothness, sturdiness and flexibility in this bulletin of the Cincinnati Electrical Tool Co., Cincinnati, Ohio. (B 939)

Heat Treating Furnaces

Electric and fuel fired furnaces for annealing, forging, hardening and die casting, and burner accessories are illustrated in Bulletin No. 39. W. S. Rockwell Co., New York. (B 940)

Corrosion Resisting Equipment

New catalog of equipment made exclusively to handle corrosive solutions gives complete data, including sizes, capacities and engineering information, on materials, parts, containers, etc. Duriron Company, Inc., Dayton, Ohio. (B 941)

Non-Ferrous Alloy Data Sheet

Exhaustive compilation of composition and mechanical and physical properties of 43 Revere bronze, brass and copper-nickel alloys, in tabular form. Revere Copper and Brass, Inc. (B 942)

Ladle Pouring Brick

Ironton ladle pouring bricks for hand, bull and crane ladles are claimed to reduce losses caused by slag entering the molds. Ironton Fire Brick Co., Ironton, Ohio. (B 943)

Electric Rivet Heaters

The Berwick rivet heater, which passes electric current directly through the rivets, provides clean, quick and economical heating, according to this descriptive bulletin. American Car and Foundry Co., New York. (B 944)

Furnace Insulation

Thermal Vermiculite insulating products for temperatures up to 2200 deg. F. are described in a leaflet issued by Thermal Products Corporation, Pittsburgh, Pa. (B 945)

Furnaces and Foundry Accessories

Bulletin No. 54 pictures various Fisher Crucible Melting Furnaces, as well as a variety of essential foundry accessories. Fisher Furnace Co., Chicago, Ill. (B 946)

MANUFACTURERS' LITERATURE

New Portable Pyrometer

Details of construction and operation of the Pyramid Pyrometer, which features quick calibration, flexible arm, and pistol type grip with conveniently visible dial, are given in this leaflet. Tamms Silica Co., Chicago, Ill. (B 947)

Precision Valve for Furnaces

The improved Mehler precision valve, claimed to afford extremely fine regulation of fuel flow, is introduced to the general furnace field. Operating data are given. Mehler, Inc., Pittsburgh, Pa. (B 948)

Controlled Reversal of Heating Operations

Type 2700 Timers automatically function any desired group of signals, valves and dampers to accomplish the actual reversal of the furnace. Automatic Temperature Control Co., Philadelphia, Pa. (B 949)

Control System

Bulletin No. 460T describes a coordinated control system for industrial processes. The Bristol Co., Waterbury, Conn. (B 950)

Open Joint Checker

This checker for blast furnace hot blast stoves is claimed to supply sufficient heating surface with only three stoves, saving the cost of the fourth stove and auxiliaries usually needed when standard bricks are used. Wm. M. Bailey Co., Pittsburgh, Pa. (B 951)

Double Chamber Melting Furnace

Monarch-Rockwell furnaces, with double heat-exchanging chamber construction fired with gas or oil, are described and illustrated. Monarch Engrg. and Mfg. Co., Baltimore, Md. (B 952)

Hammer Boards

The features of Durock and Silverock hammer boards, claimed to provide higher resistance to warping, longer service at lower cost, and faster hammer operation, are discussed. Irwin Lumber Co., Erie, Pa. (B 953)

Magnetic Separation in the Foundry

Interesting applications of the Dings high intensity separator for magnetic removal of metals from sand, abrasive grains, etc., are described. Dings Magnetic Separator Co., Milwaukee, Wis. (B 954)

Resistance to Abrasion

A practically diamond-hard surface in an alloy that can be bonded is offered by Xaloy, which can be applied to the surface of any steel, according to a leaflet issued by Wilcox-Rich, Detroit, Mich. (B 955)

Industrial Ovens

Catalog No. 14 is a collection of bulletins dealing with the various types of ovens manufactured by the Despatch Oven Co., Minneapolis, Minn. (B 956)

Ramming Mix

Instructions for installation are included in a folder claiming that P. B. Sillimanite ramming mix can be used under the most severe operating conditions. Chas. Taylor Sons Co., Cincinnati, O. (B 957)

Simplified Optical Pyrometer

Catalog No. 70 states that the PYRO optical pyrometer is a rugged instrument, simple in operation and suitable for the requirements of scientific laboratories as well as for heavy duty shop practice. The Pyrometer Instrument Co., New York, N. Y. (B 958)

Special Atmospheres for Industrial Furnaces

An instructive booklet explaining in detail the methods and composition required in designing and manufacturing inert gases. Continental Industrial Engineers, Inc., Chicago, Ill. (B 959)

Graphitic Steel

This steel which, it is claimed, combines the more desirable features of cast iron with the high strength of steel, is the subject of a pamphlet of the Timken Steel and Tube Co., Canton, O. (B 960)

Celectray Pyrometers

Catalog No. 1101C describes how these pyrometers incorporate the phototube in various ways and claims greater sensitivity and accuracy for these controllers. C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. (B 961)

Career in Arc Welding

Bulletin No. 416 tells of the practical and technical instruction given by the Lincoln Welding School. The Lincoln Electric Co., Cleveland, O. (B 962)

Hold-Heet Pyrometers

Wall type and Lance type are described and illustrated in Bulletin No. 202. Russell Electric Co., Chicago, Ill. (B 963)

Pyrometer Potentiometer

An improved potentiometer, unaffected by vibration is featured in a leaflet of The Lewis Engineering Co., Naugatuck, Conn. (B 964)

Furnace Atmospheres

The reprint of a paper by A. J. Fisher which presents data for use in solving furnace atmosphere problems from an engineering approach, is offered by the C. M. Kemp Mfg. Co., Baltimore, Md. (B 965)

Electric Heating Units and Devices

Numerous small heating units for a multitude of tasks are listed in Bulletin GED-650 of the General Electric Co., Schenectady, N. Y. (B 966)

Air Weight Control

The importance of air weight control, and the advantages of this company's controller, are given in a leaflet of The Foxboro Co., Foxboro, Mass. (B 967)

Single-Stage Motorblowers

An illustrated catalog devoted to Type FS Motorblower lists many of the applications for which it is fitted. Ingersoll-Rand, New York, N. Y. (B 968)

Adjustable Orifice and Proportioning Valves

Leaflet describing and illustrating the above is offered by The North American Mfg. Co., Cleveland, O. (B 969)

Brunorized Rails

The Brunorizing process for making better rails is described in an illustrated booklet. U. S. Steel Corp. Subsidiaries, Pittsburgh, Pa. (B 970)

Plastic Refractory Lagging

Insulag, which may be applied on hot or cold surfaces of flues, ducts, etc., as well as on refractory brick and concrete and as a finishing coat for other insulation, is for use up to 2200 deg. F. Quigley Co., Inc., New York, N. Y. (B 971)

Metal Melting Furnaces

Catalog No. 29 is devoted to the above furnaces, made interchangeable for gas or oil fuel. The Campbell-Hausfeld Co., Harrison, O. (B 972)

Tantalum

Uses, physical properties and tables of working data on the above metal are given in a booklet of the Fansteel Metallurgical Corp., North Chicago, Ill. (B 973)

Melting Furnace

The Walker furnace is identical with the cupola except that the metal is melted in a crucible, with decided advantages, according to this leaflet. Crucible Furnace Co., Inc., Charlottesville, Va. (B 974)

Sand Conditioning

The claimed advantages and mechanism of the Speedmullor, which uses centrifugal force to mull more sand in less time with lower power cost, are described in an illustrated leaflet of the Beardsley & Piper Co., Chicago, Ill. (B 975)

Wire Tester

Illustrated leaflet describes an improved type of machine for testing wire. Capacities are 0 to 250 lbs. and 0 to 500 lbs. Henry L. Scott Co., Providence, R. I. (B 976)

Galvanizing

Prolonging the life of iron and steel products is discussed in a colorful booklet on galvanizing. American Hot Dip Galvanizers Assn., Inc., Pittsburgh, Pa. (B 977)

Radiant Tube Heating Elements

The horizontal gas-fired radiant tube heating element is the subject of a leaflet of the Surface Combustion Corp., Toledo, O. (B 978)

Phosphor Bronze Bearings

General purpose bearings of many types and compositions described in a bulletin with tables of progressive size listing. Johnson Bronze Co., New Castle, Pa. (B 979)

Nickel Silver

Booklet describing this product as manufactured in sheets, strip, wire and rods, and profusely illustrated with the industrial applications of the product. The Riverside Metal Co., Burlington County, Riverside, N. J. (B 980)

Magnet Steel

"Nipermag"—a permanent magnet alloy—is the subject of an illustrated booklet. Cinaudagraph Corp., Stamford, Conn. (B 981)

MANUFACTURERS' LITERATURE

Zinc Plating

Zin-O-Lyte, a process for bright zinc plating producing brilliant deposits direct from the bath without bright dipping, is the subject of a new bulletin of the Grasselli Chemicals Dept. of E. I. du Pont de Nemours & Co., Cleveland, O. (B 982)

Flame Hardening

New method of surface hardening which heats the metal with oxyacetylene flame almost simultaneously quenching it with water is described by the Air Reduction Sales Co., New York, N. Y. (B 983)

What Scientists Say of Leitz Ultropak

Bulletin No. 17 describes the personal experiences and applications to which Ultropak has been placed by scientific workers in various fields. E. Leitz, Inc., New York, N. Y. (B 984)

Gasifier

A pamphlet on the Stewart gasifier claims that its use reduces fuel costs as much as 75%, produces a true gas of high B.t.u. value and is easier on furnace lining. Chicago Flexible Shaft Co., Chicago, Ill. (B 985)

Positive Displacement Blowers

Bulletin 22-B12 discusses the structural features of these blowers. Roots-Connersville Blower Corp., Connersville, Ind. (B 986)

Industrial Air Cleaning

Bulletin No. 904 discusses the use of electrostatic precipitators for air cleaning. The Pangborn Corp., Hagerstown, Md. (B 987)

Fluxing, Deoxidizing and Hardening Alloys

Ajax alloys are the subjects of a new leaflet issued by the Ajax Metal Co., Philadelphia, Pa. (B 988)

Surface Hardening by Induction

The TOCCO Process is discussed in an illustrated leaflet of The Ohio Crankshaft Co., Cleveland, O. (B 989)

Chapmanizing

A pamphlet devoted to Chapmanizing compares it to nitriding and carburizing. The Chapman Valve Mfg. Co., Indian Orchard, Mass. (B 990)

Manganese Steel Products

Bulletin R-1 which states that this company's rolled manganese steel follows precisely the "Hadfield Formula," also contains list of applications. Manganese Steel Forge Co., Philadelphia, Pa. (B 991)

Electric Furnaces

Catalog No. 23 devoted to the Ajax Wyatt electric furnaces, claims highest possible thermal efficiency and automatic circulation of metal bath among their advantages. Ajax Electric Furnace Corp., Philadelphia, Pa. (B 992)

Braze-Rite Furnace

This furnace, developed principally for brazing sintered carbide cutting tools, provides for localized heat to be applied only to the portion of the tool to be brazed. Firth-Sterling Steel Co., McKeesport, Pa. (B 993)

Rapid Moore Lectromelt Furnaces

Bulletin No. TC describes patented lift and swing-aside-roof type quick top-charge electric melting and refining furnaces. Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa. (B 994)

Molybdenum in Steel

Data on different types of molybdenum steels are given in an illustrated booklet of the Climax Molybdenum Co., New York, N. Y. (B 995)

Ajax-Northrup Electric Furnaces

Bulletin No. 11, superseding Bulletin No. 6, is devoted to the large coreless induction furnaces of the Ajax Electrothermic Corp., Trenton, N. J. (B 996)

Aluminum

An attractive booklet "Aluminum in Shopfitting and Display" contains a section devoted to practical points on use and fabrication. Arthur Seligman & Co., Inc., New York, N. Y. (B 997)

Testing Machines

Catalog 50, Part L, features Olsen Universal testing machines. Complete descriptions and illustrations. Tinius Olsen Testing Machine Co., Philadelphia, Pa. (B 998)

Combustion Tube Furnaces

Tube furnaces, made in two types—hinged and solid—are described and illustrated in Bulletin HD 1236. Hevi Duty Electric Co., Milwaukee, Wis. (B 999)

Nitralloy and Nitricastiron

Leaflet describing three groups of Nitralloy also discusses "Nitrard" and "Nitricastiron." The Nitralloy Corp., New York, N. Y. (B 1000)

Wellman Magazine

Items of interest and humor are contained in this monthly paper published by The Wellman Bronze and Aluminum Co., Cleveland, O. (B 1001)

Mallory Elkon

Looseleaf catalog containing engineering data, descriptions, etc., on electrical contacts for all types of service. P. R. Mallory & Co., Inc., Indianapolis, Ind. (B 1002)

Heat and Corrosion Resistant Alloys Heated by Gas

Bulletin C1-A illustrates a number of complex castings made from Q-alloys which are recommended for pipe fittings, furnace parts, etc. General Alloys Co., South Boston, Mass. (B 1003)

Electric Heating Elements

A bulletin from this company is devoted to their electric heating elements and terminal accessories for industrial applications. Globar Div., Carborundum Co., Niagara Falls, N. Y. (B 1004)

The Jetal Process

Simple immersion in an aqueous bath for about 5 minutes colors all grades of common iron or steel a brilliant and uniform jet black. It is claimed it does not alter dimensions of articles and cannot chip, scale, peel or discolor. Alrose Chemical Co., Providence, R. I. (B 1005)

Repeated Stress Machines

These machines for determining the endurance limits of bar, wire and sheet metals are described in a pamphlet of G. N. Krouse, New Kensington, Pa. (B 1006)

Bimetal

A simplified version of its manufacture and the way it works is contained in this pamphlet. W. M. Chace Co., Detroit, Mich. (B 1007)

Dolomite Refractories

This interesting pamphlet presents the case of Clinkered vs. Calcined Dolomite in the basic open-hearth steel furnace. Basic-Dolomite, Inc., Cleveland, O. (B 1008)

Liquitol

Bulletin A1-16-A deals with the use of Liquitol for iron and steel castings and ingots. Alpha-Lux Co., Inc., New York, N. Y. (B 1009)

Stainless Steels

This company claims that its materials are manufactured by special processes providing a closer metallurgical control than has been obtainable heretofore. Rustless Iron and Steel Corp., Baltimore, Md. (B 1010)

Dipping Baskets

In addition to the 14 standard designs, this company will manufacture baskets to specifications. C. O. Jelliff Mfg. Corp., Southport, Conn. (B 1011)

Yoloy

A colorful bulletin summarizes the properties of the above alloy steel. Youngstown Sheet and Tube Co., Youngstown, O. (B 1012)

Electric Air Tempering Furnace

Comparative costs in operation of the new air tempering furnace and the old salt bath show a distinct saving by the use of the new furnace, as well as improvement in quality and uniformity, according to Leaflet 36A of the American Electric Furnace Co., Boston, Mass. (B 1013)

Colmonoy

Bulletin No. 50 is devoted to the wear-resistant, corrosion-resistant and heat-resistant alloys and overlay metals of the Colmonoy Co., Los Nietos, Calif. (B 1014)

Granite City Hi-Yield 1 and 2

This company offers two types of high elastic steel for use where abrasion resistance is required. Granite City Steel Co., Granite City, Ill. (B 1015)

Car Hearth Furnaces

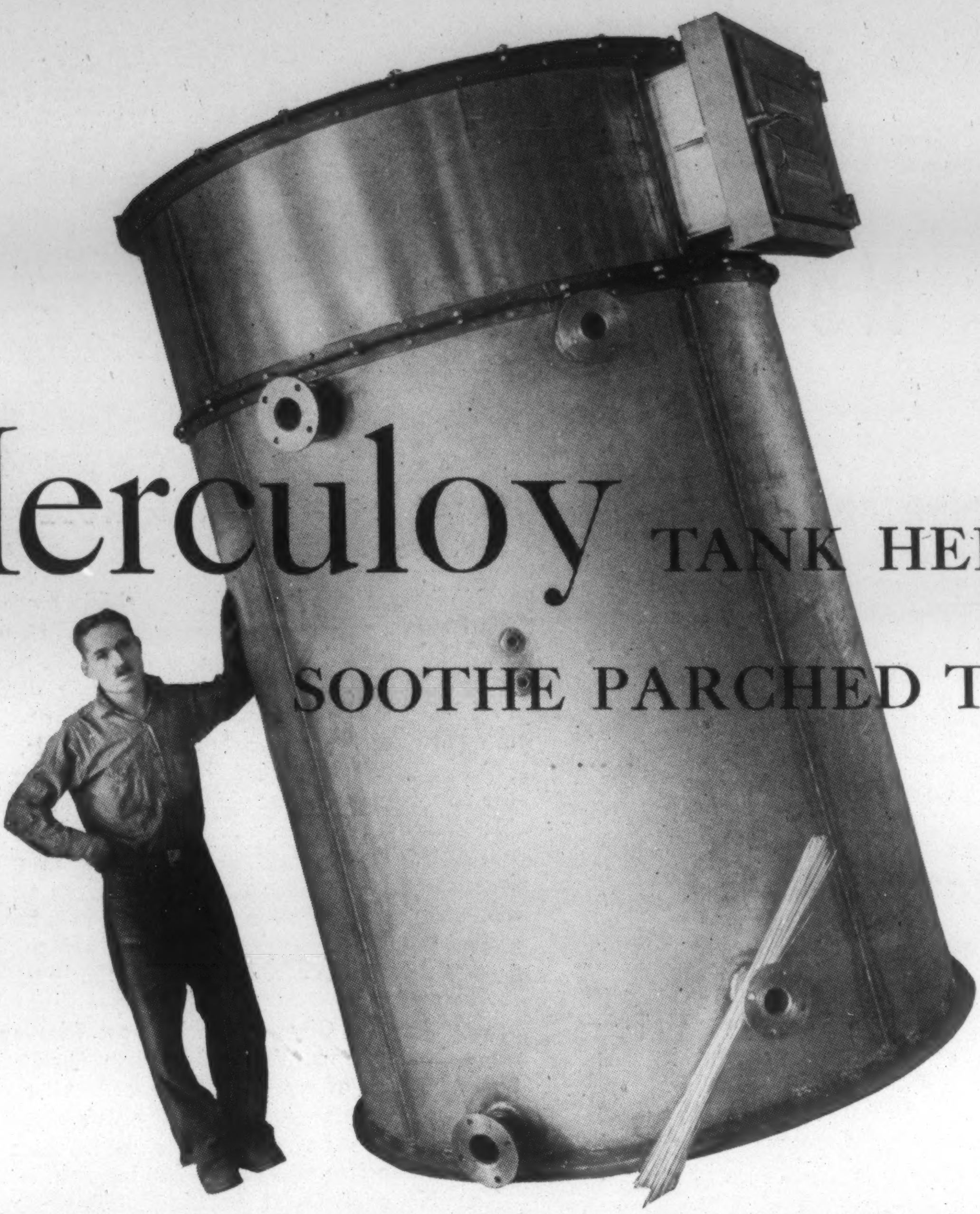
Bulletin C-736 is devoted to these furnaces which were designed for uniform heating, sturdy construction and fuel economy. The Philadelphia Drying Machinery Co., Philadelphia, Pa. (B 1016)

Impact Tester

The Riehle "VV" variable velocity impact tester is the subject of a booklet of the Riehle Div., American Machine & Metals, Inc., New York, N. Y. (B. 1017)

Industrial Furnaces

Oil, gas and electric furnaces are described and illustrated in Catalog No. 6 of the Mahr Manufacturing Co., Minneapolis, Minn. (B 1018)



*Herculoy TANK HELPS SOOTHE PARCHED THROATS

. . . *in New Library of Congress Annex*

The above illustration shows a 1400-gallon tank from which chilled drinking water will be supplied in the new building. The tank is made in two sections. The lower section is approximately six feet in diameter by 7 feet high and contains the water. Bolted to this is a top section approximately two feet high which contains a cooling coil connected to two Carrier ammonia machines. The entire tank is made of Revere Herculoy lined with block tin, and was fabricated by L. O. Koven & Brother, Inc., Jersey City, N. J., for Carrier Corporation, Newark, N. J.

Herculoy was chosen because of its well known characteristics of high resistance to corrosion and great tensile strength. The tank was fabricated by welding, for which Revere Herculoy Welding Rod was used.

Because Revere Herculoy combines corrosion-resistance equivalent to that of pure copper, with mechanical strength comparable to that of steel, it is extremely useful for any purpose where both of these qualities are needed in one material. Obviously, it is especially applicable to chemical equipment.

Revere Technical Advisory Service is available for consultation regarding possible applications of Herculoy, or other Revere copper base alloys, in any chemical or process industry. The members of this service are especially trained to cooperate competently with your own engineers or consultants. For information please address our Executive Offices, 230 Park Avenue, New York City.

*U. S. Patent Nos. 1,868,679; 1,924,581; 2,002,460; 2,009,977.

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Current News Items

Conference on Creep and Fatigue

A two-day conference on creep and fatigue of metals will be a feature of the special summer program and conferences on the strength of materials under the sponsorship of the Massachusetts Institute of Technology, Cambridge, Mass. The special conference on fatigue and creep is scheduled for July 15 and 16. The papers to be presented cover the various aspects of these subjects and present some of the problems experienced in certain industries. Dr. H. J. Gough of the National Physical Laboratory, England, will be a speaker. The program follows:

CREEP: 9:00 to 12:00 noon, July 15
Chairman, E. L. Robinson, General Electric Co.
INTRODUCTORY PAPER
H. J. French, International Nickel Co.
"THEORY OF CREEP" by A. Nadai, Westinghouse Electric & Mfg. Co.
"PROBLEMS OF TURBINE INDUSTRY" by C. R. Soderberg, Westinghouse Electric & Mfg. Co.
DISCUSSION

FATIGUE: 2:00 to 5:00 P.M., July 15
Chairman, John M. Lessells, Massachusetts Institute of Technology
"EUROPEAN DEVELOPMENTS" by H. J. Gough, National Physical Laboratory, Teddington, England
"CORROSION FATIGUE" by D. J. McAdam, Jr., Bureau of Standards
"LIGHT ALLOYS" by R. L. Templin, Aluminum Co. of America
"STRUCTURAL PROBLEMS" by A. V. Karpov, Chairman, A.S.C.E. Committee on Fundamentals Controlling Structural Design
DISCUSSION

CREEP: 9:00 to 12:00 noon, July 16
Chairman, C. R. Soderberg, Westinghouse Electric & Mfg. Co.
"PROBLEMS OF TURBINE INDUSTRY" by E. L. Robinson, General Electric Co.
"PROBLEMS OF VALVE INDUSTRY" by J. J. Kanter, Crane Co.
"PROBLEMS OF OIL EQUIPMENT INDUSTRY" by T. McLean Jasper, A. O. Smith Corp., and A. B. Kinzel, Union Carbide & Carbon Research Laboratories, Inc.
DISCUSSION

FATIGUE: 2:00 to 5:00 P.M., July 16
Chairman, A. V. deForest, Massachusetts Institute of Technology
"UNITED STATES DEVELOPMENTS" by H. F. Moore, University of Illinois
"PROBLEMS OF ELECTRIC INDUSTRY" by R. E. Peterson, Westinghouse Electric & Mfg. Co.
"PROBLEMS OF RAILROAD INDUSTRY" by R. W. Clyne, American Steel Foundries
"PROBLEMS OF AIRCRAFT INDUSTRY" by K. Arnstein, Goodyear-Zeppelin Corp.
DISCUSSION

Motion Picture on Cemented Carbides

The American Cutting Alloys, Inc., 500 Fifth Ave., New York, has exhibited before private groups in New York and Philadelphia its new imported motion picture film on the "Manufacture and Use of Cemented Titanium-Tungsten Carbide Tips and Tools in High Speed Cutting of Steel and Cast Iron." The film is a talking motion picture, which was made abroad, particularly in Germany, showing the use of cemented carbide tools in modern machine tools cutting at high speeds.

It graphically shows the making of the carbide powders and tips. It goes into considerable detail in the making of the carbide tipped tools, illustrating brazing on of tips and grinding of the tool including cutting angles and chip breakers. It shows numerous uses of the tools in cutting particularly steel at high speed.

The film was developed abroad by Dr. Ing. Paul Schwarzkopf of Reutte, Austria, inventor of titanium carbide and president of the American Cutting Alloys, Inc., who worked in cooperation with the Deutsche Edelstahlwerke A.G., Krefeld, Germany.

Most of National Metal Show Space Sold

Ninety-one per cent of the exhibit space at the 19th annual National Metal Show, to be held Oct. 18 to 22 in the Atlantic City Auditorium, has already been contracted for by 189 industrial companies, W. H. Eisenman, managing director, has announced. Mr. Eisenman is also national secretary of the Society sponsoring the show, the American Society for Metals.

"The Metal Show has been filled to capacity so regularly in the last few years that this isn't news any more," he commented. "It is news, however, when so much of the exhibit space is contracted for five months in advance of the opening date. And it is news too when this is the result of an announcement only to a select group of previous exhibitors. In other words with only 31 exhibit spaces remaining, we have yet to formally contact the general list of hundreds of industrial prospects who should be represented."

The Atlantic City Auditorium provides an ideal site for this year's Metal Show. The auditorium itself is a huge affair with 154,348 sq. ft. of space on one floor. All exhibits will be on this floor, which is unencumbered by pillars or posts that would interfere with a broad view of all exhibits. As a result, every exhibit in the Auditorium will have a fine location.

The National Metal Congress, held in conjunction with the Metal Show, convenes on the second floor of the Auditorium. Five international societies cooperate in this event, holding their conventions and technical sessions during the entire week. The cooperating societies are, in addition to the American Society for Metals, the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Welding Society, American Society of Mechanical Engineers and the Wire Association.

J. F. Lincoln Lectures Before British Societies

J. F. Lincoln, in whose honor was created The James F. Lincoln Arc Welding Foundation, sponsor of the $200,000 Arc Welding Award Program, is in England giving a series of talks at the invitation of various engineering societies and institutes. Groups before whom Mr. Lincoln is scheduled to speak include the South Wales and Monmouthshire Institute of Engineers, the Institute of Engineers and Shipbuilders of Scotland, the Institute of Mechanical Engineers in London, and others. Mr. Lincoln's invitations to speak in England were prompted by growing interest, on the part of British firms and societies, in the application and use of electric welding in manufacture and construction. Mr. Lincoln is director of Lincoln Electric Co., Ltd., London, England, affiliate of The Lincoln Electric Co., Cleveland, of which he is president.

● The Kloster Steel Corp., Chicago, has just completed the erection of a new and modern tool steel warehouse, where it will stock a greater tonnage of "Pure-Ore" fine tool and alloy steels.

● P. R. Mallory & Co., Inc., Indianapolis, announce the purchase of the assets, good will, trade-marks, patents and patent rights of Electrad, Inc., New York City. L. A. de Rosa, chief engineer, and other key employees of Electrad, Inc. will join the Mallory organization. Plant and offices will be moved to Indianapolis.

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The Timken steel plant is large enough to take care of almost any demand for alloy steel and seamless tubing—but small enough to permit personal supervision by the management at all times.

This active personal interest is reflected in the consistently high and uniform quality of TIMKEN Steels and the close attention that is given to individual customers' requirements and problems.

When you become a user of TIMKEN Alloy Steels or TIMKEN Carbon and Alloy Seamless Tubes you will be assured of every benefit and advantage the technical and productive facilities of the Timken organization have to offer. Furthermore, you will find that Timken service extends far beyond the entering of your orders and the shipping of the material. It follows the performance of the steel in your product to assure that you receive the utmost satisfaction which Timken quality is capable of giving.

If the steel you are now using is not the most suitable analysis for your needs, Timken metallurgists will suggest an analysis better suited to both service and fabrication requirements. We are ready to discuss your steel situation at any time.

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A Research Program on Tin

A three-year research program on the fundamental properties and behavior of tin has been established in the Metals Research Laboratory at the Carnegie Institute of Technology, Pittsburgh, by the Bristol-Myers Co., manufacturing chemists, of Hillside, N. J., according to Dr. R. F. Mehl, director of the laboratory.

Three men will devote their entire time to the work and will receive assistance from other members of the staff. Dr. Gerhard Derge of the laboratory staff will head the group and will be assisted by John Warren Stewart, a senior in the department of metallurgy at Carnegie Tech, and Paul A. Beck, a graduate student at the Michigan School of Mining and Technology.

The work which got under way on July 1, will be devoted to the science of tin rather than to its practical applications. Though the research program is not yet settled, it will probably include studies on extrusion velocities, the generation of protective layers on tin, the rate of hardening and softening, the types and amounts of impurities in high-purity tin and their effects on the properties of the metal. Tin is widely used in the manufacture of tubes and containers for toothpaste and other similar articles of trade.

The results of this work will be freely published as a contribution to science and will not be held as private commercial information.

The International Tin Research and Development Council in England has sponsored a great deal of research on tin, but this is the first American study of the fundamental properties of this element. The grant from Bristol-Myers will add considerably to the program of the Metals Research Laboratory at Carnegie Tech, and will be in keeping with the policy of the laboratory in performing fundamental investigations on metals.

Tillman Graduate Fellowship in Metallurgy Conferred

An award, known as the Robert Tillman Memorial Graduate Fellowship in Metallurgy, was conferred recently on Peter A. Vukmanic, graduate student at Carnegie Institute of Technology, Dr. R. F. Mehl, head of the department, has announced. The fellowship, carrying with it a grant of $1200 a year, covers a period of three years' technical research and study.

The fellowship was established several months ago by Messrs. Ralph F., Lamber J., Joseph L., and Raymond L. Tillman, in behalf of The Industrial Steel Casting Co. of Toledo, Ohio, as a memorial to their brother, Robert B. Tillman, who died Jan. 24, 1934. The late Mr. Tillman was born in Toledo, April 7, 1907, and received his primary education in parochial schools there. He later attended St. John's high school, and was graduated, with the Bachelor of Arts degree, from St. Johns University, in 1929. Following this he engaged in graduate work at Carnegie Institute of Technology in the field of metallurgy and metallography.

Mr. Vukmanic will begin his program of study during the coming summer, applying his efforts to various problems to be arranged and outlined by Carnegie Tech in collaboration with The Industrial Steel Casting Co.

Houghton Research Sales Staff

In line with plans which have been under way for some time, the organization of the Houghton Research Sales Staff was recently announced by Major A. E. Carpenter, president of E. F. Houghton & Co., Philadelphia. Widely known as manufacturers of industrial oils and leathers, this company's facilities have been rapidly expanded in recent years. The organization of the staff is designed to keep the high standards of Houghton research and service in line with the increasing demands of industry, both here and abroad.

Every man on the Houghton research sales staff is a specialist in his particular field. The staff is made up of five divisions: Textile, industrial lubrication, metal working, leather, and leather oils and greases. Each division is headed by a research engineer whose duty is three-fold. He works to develop new products, to better existing products when possible, and to render a real service to individual concerns in the industry he covers. The staff is under the supervision of L. D. Holland, manager of marketing research.

World's Largest Plant for Sintered Carbides

The largest plant in the world devoted exclusively to the production of sintered carbides—a tool material second only to diamonds in hardness—has been completed by the Firth-Sterling Steel Co. at McKeesport, Pa.

The building bears no resemblance to the typical gaunt steel plant. Surrounded by a garden, the structure is distinctly modernistic in design, and such decorative materials as glass brick, plate glass, stainless steel, and aluminum have been used in its construction.

The entire plant is in keeping with the product, which might be regarded as the "jewelry" end of the steel business, as sintered carbides sell for $200 to $400 per lb.

So carefully must the cleanliness of the materials which go into the making of Firthite and Firthaloy be controlled that the interior of the building provides even more surprises than the exterior.

Some rooms have terrazzo floors, Carrara glass walls, and linoleum ceilings, so that every surface may be washed to eliminate the possibility of any foreign matter which would cause defects in the finished tools. A dust filtering ventilation system has been provided as a further precaution, and provision has been made for the future installation of an air conditioning system.

One room, which houses the ball mills where powdered materials are crushed and mixed, has been soundproofed to bring about an 85 per cent reduction in the noise resulting from the operation. Throughout the plant, every possible means has been used to provide pleasant working conditions and to insure cleanliness of the products.

Sintered carbides are made from extremely fine metallic powders of tungsten, carbon and cobalt mixed together, pressed in a mold to form a blank or tip, then heated in a hydrogen furnace to a temperature where the metal with the lower melting point softens while the others retain their solidity. The plastic metal then coalesces with the solid particles and on cooling the mass becomes a solid hard metal piece of a predetermined shape.

Nickel Co. Establishes Metallurgical Fellowship at Carnegie

A research fellowship to run three years and pay $1200 annually has been established in the department of metallurgy at the Carnegie Institute of Technology by the International Nickel Co., Inc., of New York City.

Richard T. Myer, a graduate student at Purdue University, has been selected to receive the fellowship. The research project to be undertaken will be decided following consultation with officers of the company, and work will begin this summer. He will perform his studies under the direction of Dr. R. F. Mehl, head of the department of metallurgy.

The International Nickel Co., well-known for its active program of research within its own organization, is through this fellowship making possible the training of a type of scientist much needed by the metallurgical industries.

Carnegie Tech is expanding its department of metallurgy and is particularly glad to have fellowships of this kind sponsored by industry. The department now has available ten assistantships and fellowships for graduate students, six of which are supported by industrial concerns, including the Aluminum Company of America and the Molybdenum Corporation of America, both of Pittsburgh.

● A. W. Sikes, materials engineer, has recently been transferred from Washington, D. C., to the Chicago Office of the Public Works Administration, Engineering Division. Mr. Sikes, who holds a commission as captain, chemical warfare service reserves, was graduated May 1 from the three months' Line and Staff Officers Course, Chemical Warfare Service School of the United States Army at Edgewood Arsenal, Maryland."

● Gerhard Ausel on July 1 joined the metallurgical staff of the Dow Chemical Co., Midland, Mich. He was previously connected with the Metals Research Laboratory of Carnegie Institute of Technology, Pittsburgh.

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SHROUDED IMPELLER
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The New "CS" MOTOR-IR-BLOWER

BACK of the clean-cut appearance of these new CS units are the same design characteristics that have made Motorblowers known throughout the country as the most efficient and dependable machines of their type.

In supplying combustion air to furnaces and ovens, for which it was particularly designed, this new Motorblower offers an extremely flat pressure characteristic. This permits a wide variation in the number of burners that can be operated simultaneously, without effecting an appreciable change in the pressure of air being supplied.

Bulletin No. 2310 covering this machine will be sent upon request.

The I-R line includes blowers of all types up to 12,000 hp.

Other Ingersoll-Rand products widely used in industry are more than 1000 sizes and types of air and gas compressors and vacuum pumps; a complete line of single- and multi-stage Cameron pumps; surface and barometric condensers; water-vapor refrigeration units; Diesel and gas engines; and rock drills and pneumatic tools of all kinds.

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A. F. A. Awards Prizes for Essays

During the convention and exposition of the American Foundrymen's Association held in Milwaukee in May, apprentices from the Milwaukee area who were invited to attend the exhibit, were instructed to prepare written reports for their teachers and supervisors.

The Association offered three prizes as follows: (1) $15.00, (2) $10.00, (3) $5.00, for the best essays or reports submitted by these apprentices. About 75 written reports were submitted and were judged by a committee consisting of Chairman Bruce Simpson, vice-president, National Engineering Co.; J. D. Burlie, foundry engineer, Western Electric Co.; and Tom Brown, foundry instructor, Lane Technical High School, all of Chicago.

The papers were judged from the standpoint of the manner in which they reflected benefits secured by the individual apprentice during his visit to the exhibition. They were rated by the reflection of the inspiration which the apprentice secured to further the effort and knowledge which he had gained of methods and processes displayed by the exhibit of foundry materials, machinery and methods.

The committee has announced its decision and the awards were as follows: First prize, Robert Jablonowski, Sivyer Steel Castings Co.; second prize, Anton Lemko, Jr., Motor Castings Co.; third prize, Gordon T. Wagen, C. M. St. P. & P Railway Shops.

Coffin Fellowship Awards

Advanced scientific research will be carried on during the coming year by eight selected students in leading universities throughout the country under the provisions of the Charles A. Coffin Fellowships, Dr. Willis R. Whitney, vice president of the General Electric Co., has announced.

Established by General Electric in 1922 to honor its retiring president and founder, Charles A. Coffin, these fellowships, totaling $5000 annually, are awarded yearly to graduates of colleges in the United States who have shown by the character of their work that they could with advantage undertake or continue research work in educational institutions either in this country or abroad. Since 1923, approximately 100 students have been enabled by these fellowships to accomplish important studies. Among their ranks is the 1936 Nobel prize winner in chemistry, Carl Anderson, who won an award in 1927.

Of the 1937-8 fellowships, two are renewals. Julian Schwinger at Columbia, who is studying the scattering of neutrons by deuterons, and Harold G. Vogt at Harvard, who is investigating the nature of the neutron, also won awards last year.

The six other 1937-8 winners of the Coffin Fellowships are pursuing a varied group of subjects. Joseph R. Dietrich, of the College of William and Mary, will study the propagation of potential in discharge tubes. He will carry out this work at the University of Virginia. Henry P. George, of Lehigh University, will engage in research work at Carnegie Institute of Technology and his problem will pertain to the rate of diffusion at grain boundaries. Donald L. Herr, of the University of Pennsylvania, will remain there studying oscillation in non-linear circuits.

Two of the winners will study at the Massachusetts Institute of Technology. Nathaniel I. Korman, of Worcester Polytechnic Institute, will do research measurements at ultra-high-frequencies; and Stuart T. Martin, Jr., already at M. I. T., will observe the thermionic emission and absorption properties of tungsten crystals.

Richard W. Mattoon, of Antioch College, will study the deposition of successive monomolecular films onto solids. This work will be done at the University of Chicago.

The minimum amount awarded in a Coffin Fellowship is $500, and frequently a student obtains a larger amount as his studies demand. Since 1923, when the fellowships were first given, approximately $75,000 has been paid to their holders.

● Skilsaw, Inc., 3310 Nilston Ave., Chicago, announces the election of Edward W. Ristau as vice-president. Mr. Ristau will continue his work of the past five years in directing sales, advertising and promotion.

● The Revere Copper & Brass, Inc., has issued a chart which condenses on a full-sized sheet information on the chemical and physical properties of the company's alloys.

Aluminum Co. Metallurgists Confer

A meeting of the metallurgists of Aluminum Co. of America was held in New Kensington in June to coordinate the technical activities in the various works of the company. Called by the company's technical committee, it enabled the men to exchange basic ideas on aluminum metallurgy and to familiarize themselves with the individual problems of each plant or division. These problems included not only those of pure and applied research, but of fabrication as well. Applications for the metal were also discussed with particular reference to the adaptability of aluminum. The metallurgical delegates present at this meeting included those from Aluminum Research Laboratories and the major reduction and fabricating divisions of the company as well as representatives from the development and mechanical engineering divisions.

Central Metallurgical Department for American Steel & Wire

The American Steel & Wire Co. has created a central metallurgical department designed to coordinate and assist the district metallurgical departments which are kept intact.

The new department is headed by J. S. Richards, formerly director of manufacturing practices and is a division of the operating vice president's office. Besides Mr. Richards, the personnel of the new division consists of C. W. Meyers, assistant manager, and the following Division metallurgists:

W. F. Conlin, in charge of steel standardization, practices and committee work; J. R. Thompson, in charge of low alloy and carbon practices; A. E. Hibschman, in charge of high carbon and special practices; C. A. Schacha, in charge of metal practices, and E. F. Oviatt, in charge of packaging, specifications and general standard practice activities.

Electrochemists Will Meet in St. Louis

The 72nd convention of the Electrochemical Society will be held at St. Louis, Oct. 13 to 16, 1937. The Hotel Chase has been selected as headquarters. St. Louis today, one of the most modern commercial cities in America, has a background of more than a century of historical events. The plans for the convention are under the able direction of Prof. Lawrence E. Stout of Washington University, who is chairman of the local committee.

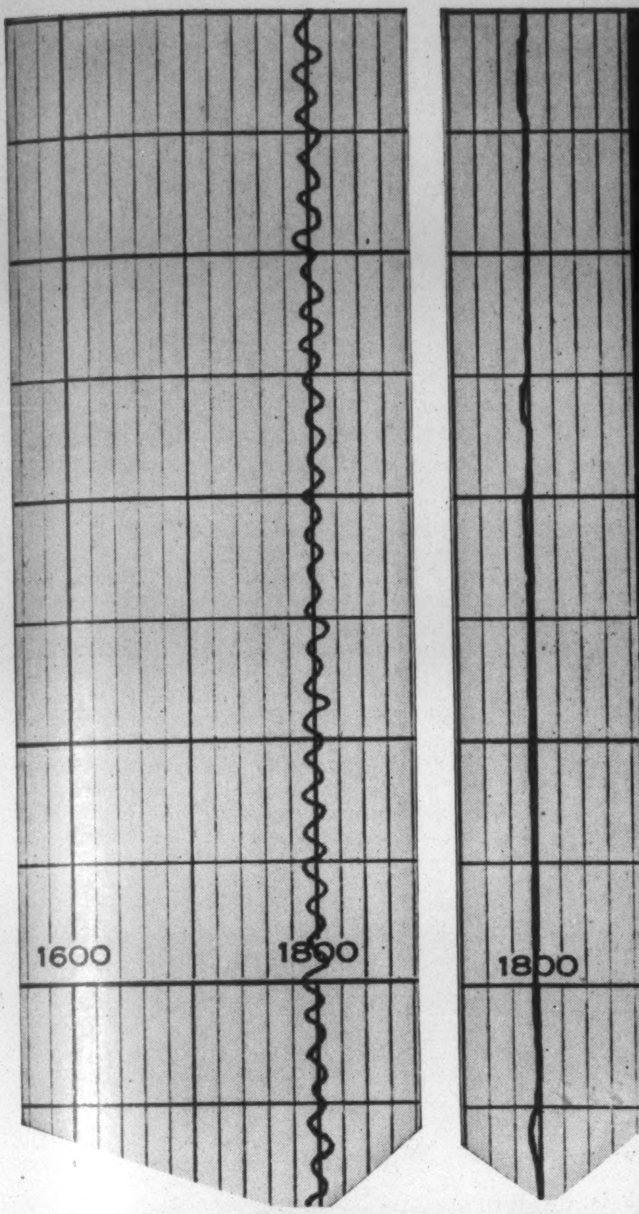
A.S.T.M. Research Fund Increased

Dr. Frank O. Clements, technical director, Research Laboratories, General Motors Corp., Detroit, and past-president of the A.S.T.M., has recently given to the society approximately $7000 to be added to the principal of the A.S.T.M. Research Fund, in the form of shares of common stock of the General Motors Corp. Under the terms of the deed of gift the income from this sum will be paid to an annuitant during her lifetime, after which the income reverts without restriction to the research fund. This very substantial gift brings the principal of the fund up to $20,000. In accepting the gift, the executive committee has expressed to Dr. Clements its sincere appreciation.

● John Wilbur has been appointed to the Cleveland office of Electro Metallurgical Sales Corp. Following his graduation from Yale University in 1933, Mr. Wilbur was first associated with the Niagara Falls works of Electro Metallurgical Co. For the past year and a half he has been with Electro Metallurgical Sales Corp. in their New York office. Both organizations are units of Union Carbide & Carbon Corp.

● The Duraloy Co. announces the appointment of Harvey T. Harrison as sales manager with headquarters at the main office and plant, Scottdale, Pa. Mr. Harrison was for several years in charge of sales in the Cleveland territory for this company.

● R. R. LaPelle, formerly with the Salem Engineering Co., has become associated with The Philadelphia Drying Machinery Co., as a member of its industrial furnace division.



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COMPLETELY L&N FROM COUPLE TO VALVE

TYPICAL of the improvement in temperature regulation which Micromax Electric Control brings even to well-regulated industrial furnaces is that of the 3-zone annealing furnace shown above. Temperature assumes straight-line characteristics. Combustion efficiency is improved. Products of combustion are such that scaling is minimized and pickling simplified. "This Control," says its user, Keystone Steel & Wire Co. of Peoria, "is very satisfactory . . . far ahead of any we have used."

All parts of Micromax Electric Control are designed and made by L&N. Valve drive and relay are coordinated with the controller to take full advantage of Micromax sensitivity . . . to assure typical Micromax dependability.

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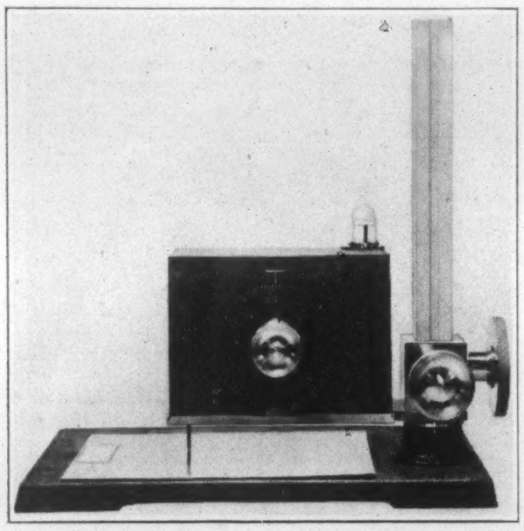
New Equipment and Materials

Instrument for Measuring the Thickness of Nickel Coatings on Non-Magnetic Base Metals

The local thickness of an electroplated nickel coating on a non-magnetic base metal may be measured by a new instrument announced by the American Instrument Co., Silver Spring, Md. The principle of the method involves the measurement of the force required to detach one pole of a permanent magnet from the nickel coating, and the comparison of this force with that required to detach the same magnet from a similar nickel coating of known thickness.



The instrument is calibrated with nickel coatings of known thickness which have been deposited under about the same conditions as the coatings to be tested. Nickel coatings deposited under different conditions have somewhat different magnetic permeabilities, but if such coatings are annealed at 400 deg. C. (750 deg. F.) they acquire about the same permeability, therefore the magnetic method is more reliable for annealed coatings than for coatings as deposited. Measurements on coatings as deposited are correct within ± 15 per cent, and on annealed coatings within ± 10 per cent.

The magnetic method is rapid and non-destructive and, for thin coatings, its accuracy approaches that of metallographic measurements. The metallographic method (in which the thickness of coatings is measured by means of a microscope and scale) requires experience and expensive equipment, and results in destruction of the specimen tested.

The sensitivity of this instrument can be varied by the proper selection of the spring, each division on the dial corresponding to approximately 0.00025 mm. (0.00001 in.) of nickel, so that the 100 divisions cover the range of thickness usually applied to non-ferrous metals. The reproducibility is about 3 per cent on coatings down to about 0.0005 mm. (0.00002 in).

The new instrument is equally applicable to plane, convex and concave surfaces. The presence of the usual thin chromium coatings over the nickel has no appreciable effect on the thickness measurements, and is advantageous because it prevents oxidation of the nickel during annealing.

The new instrument is compact and light in weight; it measures 5x9x9 in. high, and weighs only 7½ lb. without its carrying case.

Electrode Designed for Fillet Welding

A new electrode which eliminates the necessity of multiple pass welding in production of fillet and lap welds in many applications, and which permits production of such welds without undercutting or overlap, is announced by The Lincoln Electric Co., Cleveland. Fillet welds up to ⅜-in. in size, with one plate vertical, can be produced in one pass with the electrode. The welds show no undercutting at the vertical plate and no overlap at the horizontal plate.

Fillet welds of any size can be made more easily, of better quality and at higher speed with the electrode than was heretofore possible. The advantages will be apparent in all applications for fillet welding including shipbuilding, bridge and building construction, fabrication and manufacture.

The new electrode, designated as "Fleetweld 8", is the result of considerable research and experiment by Lincoln engineers to develop an electrode which would simplify fillet welding and improve its quality and economy.

The new electrode is heavily coated for welding by the shielded arc process. The welds produced are smooth and dense with notably high physical properties. The tensile strength of the weld metal as deposited is 68,000 to 72,000 lbs. per sq. in. Ductility is 20 to 30% elongation in 2-in. as deposited, and 30 to 36% stress relieved. Other properties, including resistance to fatigue, impact and corrosion, are equal to or better than mild steel.

"Fleetweld 8" comes in 14 and 18-in. lengths. The 14-in. lengths are made in ⅜, $\frac{5}{16}$, ¼, $\frac{3}{16}$ and $\frac{5}{32}$-in. sizes, while the 18-in. lengths come only in the ⅜, $\frac{5}{16}$, and ¼-in. sizes. The electrode will be found of particular value by firms whose products require production of high quality fillet and lap welds at maximum speed and economy.

Cupaloy

"Cupaloy," an alloy of copper and chromium, is a development of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to fill a growing industrial demand for a metal having the desirable thermal and electrical properties of copper, and at the same time free from the mechanical weakness of copper. It is claimed that Cupaloy meets this demand.

According to the company, the problem was to develop a metal with a high electrical and thermal conductivity, and with the same hardness and strength as an 0.30 per cent carbon steel. Many of the existing alloys showed one typically bad characteristic—if the thermal and electrical conductivities were good, the hardness and strength approximately correct, the metal could be neither machined or drawn successfully. The obvious solution was an alloy which could be cold worked like copper and the finished part then heat treated to bring out the desirable physical and mechanical properties.

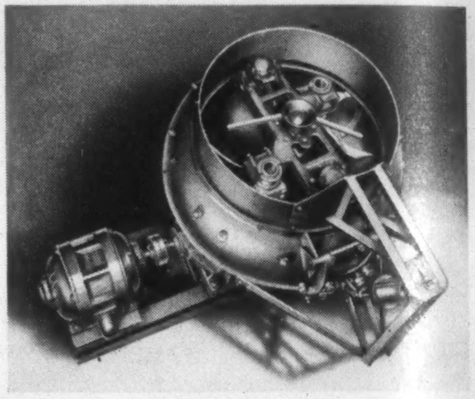
The alloy Cupaloy is described as meeting all these conditions. As cast and quenched, it can be handled as copper. After cold drawing, machining or other cold forming, it is properly heat treated to give it the most desirable physical and mechanical properties.

Its tensile strength is reported as 65,000 to 75,000 lbs. per sq. in. with a yield strength of 60,000 to 65,000 lbs. and an elongation of 17 per cent and a reduction of area of 60 per cent, after full heat treatment. Its Brinell hardness is 150.

Speedmullor New Sand Conditioner

The Beardsley & Piper Co., Chicago, has designed and developed a revolutionary type of foundry sand muller, the "Speedmullor," and is offering this unique unit to the industry. The maker claims that centrifugal force is advantageously used to thoroughly mull more sand, in less time, with great economy in power consumption and operating costs. The Speedmullor is designed to mull with equal facility facing, backing or compound and oil core sands.

The mulling mechanism consists of a cross head mounted on a vertical shaft revolving approximately 90 r.p.m., from which two 20-in. diameter, rubber-covered spherical mullers are pivotly supported, to swing outward by centrifugal force, being adjustable as to throw. The cross head is equipped with two outside and two inside plows for delivering sand outwardly, inwardly and upwardly, and for holding the sand in suspension in the path of the mulling balls and the spherical side walls of the bowl, thereby delivering all of the sand of the batch into the effective muller track area while subjecting it to approximately two mulling and four aerating actions per revolution.



The wear-resisting muller bowl has a 5 ft. 2 in. inside diameter, and is equipped with an air cylinder operated side dump discharge door with remote control for instantaneous discharge of the mulled sand.

Heavy Coated Shield Arc Electrode

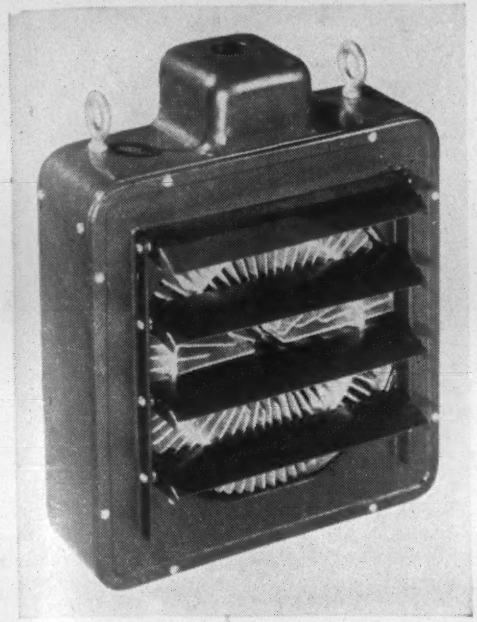
The Champion Rivet Co., Cleveland, has developed, and is now offering to the trade a heavily coated shielded arc electrode for welding the low alloy and higher carbon high tensile steels.

This electrode is known as "Champion Blue Devil-85." It can be used in any position—flat, vertical and overhead—and is scientifically and specifically designed to weld effectively and produce welded joints having all the individual characteristics inherent in such steels as —Cor-ten, Man-ten, Sil-ten, Chromansil, Hi-Steel, 79-90, Yoloy, R.D.S., and HT 50; also carbon-molybdenum steel, silicon killed plate (A.S.T.M. 149 and 150) and the low nickel content steels.

Complete test data, welding procedure, and other technical information will be gladly furnished by The Champion Rivet Co. Cleveland.

Electromode Industrial Heater

A new "Electromode Industrial Heater" (Model IBN) has been announced by the Electric Air Heater Co., division of The American Foundry Equipment Co., 555 South Byrkit St., Mishawaka, Ind. Many completely new features are used in the design of this heater, such as the single, cast, circular grid; a cast aluminum fan housing, and a stronger housing construction.



The heat source in the new Electromode Industrial Heater is a cast aluminum grid, which has been poured around a calrod heating element. This grid construction eliminates all hot wires and dead air space, assuming economical and safe operation at all times.

A motor driven, four-bladed aluminum fan, running on a graphite impregnated bronze bushing for quiet operation, dissipates heat from the entire surface of the circular grid and circulates the warm air. Heat can be directed wherever it is needed by moving a series of adjustable deflectors mounted on the front of the unit.

The Electromode Industrial Heater is equipped with an "On" and "Off" switch and is provided with a thermal safety switch to prevent damage to the grid from overheating should the fan or air circulation stop for any reason. This unit is obtainable with thermostatic control.

Rubberizing Compound Requires No Primer

Heretofore a separate primer has been necessary before rubber coating could be applied to metal or other surfaces to protect against corrosion.

Since the application of a primer requires extra labor and extra time for drying, the research laboratory of the Self-Vulcanizing Rubber Co., 605 W. Washington Blvd., Chicago, manufacturers of self-curing rubber plastics and liquids for protection against corrosion and abrasion, has carried on an exhaustive research and is no announcing "Self-vulc Insulator." This is a rubber compound which incorporates the quality of a primer with a self-curing, cold-curing, rubber which can be applied by unskilled labor by dipping, spraying or by hand brushing.

This new product makes a steadfast bond in one application, but repeat coats to any desired thickness may be added. A vulcanizing period of 1 hr. is all that is required for first or following coats. There is practically no shrinkage in application, the product being 90% pure rubber, and is gives a very smooth, enamel-like finish on any surface.

Aside from being an insulator and waterproofer, it resists and stops corrosion caused by alkalies, salt solutions, mild acids and their fumes, and is used for covering girders, ducts, ventilators, hoods, pipes (exterior and interior), tanks, vats, tubs, walls, ceilings, bodies and frames of tank cars, structural steel, etc.

Protective Linings of Permobond

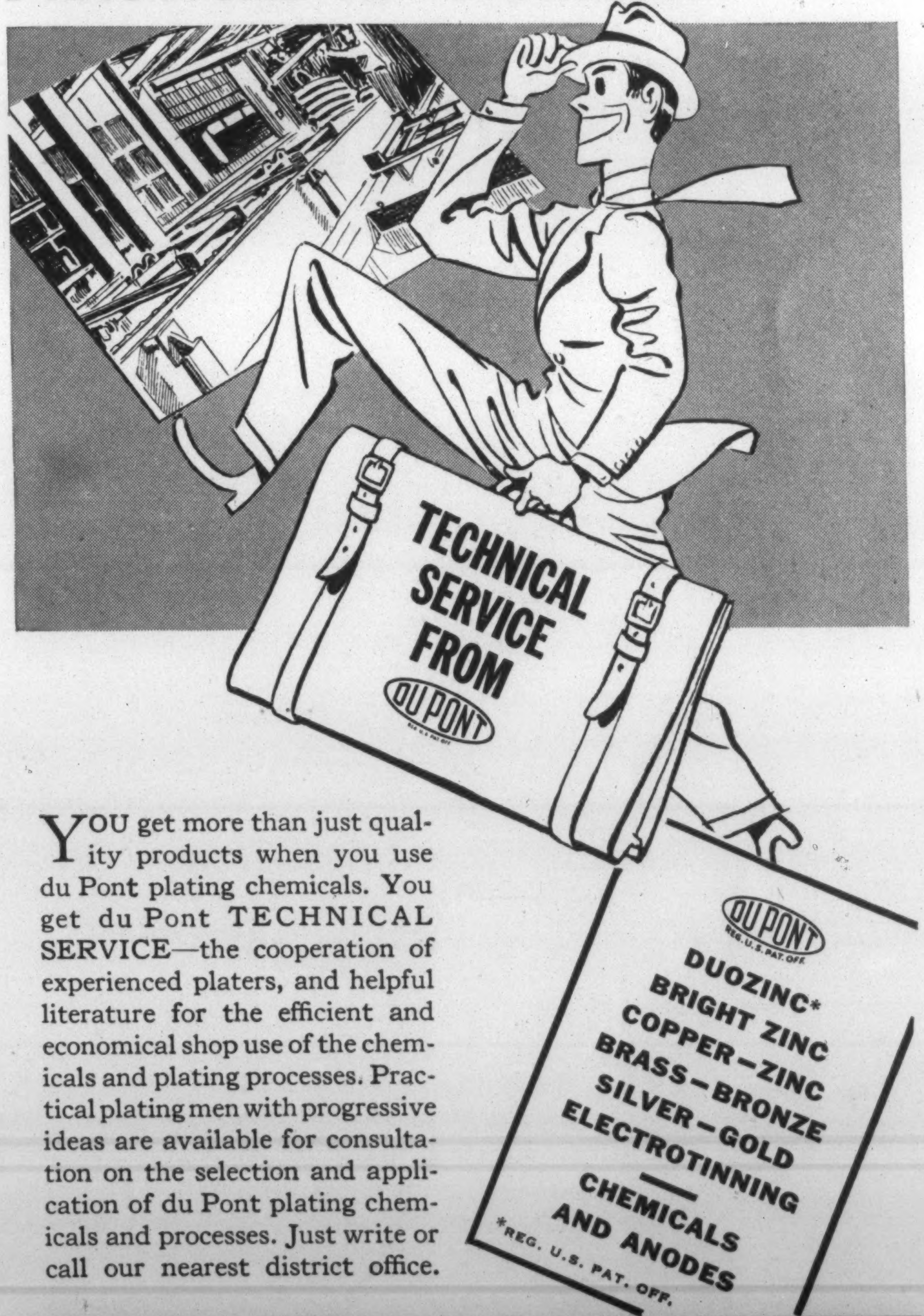
United States Rubber Products, Inc., 1790 Broadway,, New York, has announced that its "Permobond" corrosive-proof protective linings are now available for practically every kind of service. Permobond, first developed in 1924, has, through the extensive advances made in the compounding of rubber and the perfecting of the bonding of rubber-to-metal process, reached a point where it offers distinct advantages over linings fabricated from other materials. It provides maximum resistance to corrosion, diffusion, abrasion and electrical conductivity.

The success of Permobond linings is based on three things: One, compounding the rubber to meet the specific problems of the job; two, the permanent bonding of the lining to the walls of the tank; and, three, the fact that Permobond linings are tailor-made and that no workman puts a hand to the job until U. S. Rubber engineers have planned it for design, facility of installation and specification of rubber. There are many classes of chemicals which may be handled more satisfactorily with rubber than with any other lining substance. Steel or wood containers, lined with rubber, will stand up in contact with these chemicals for a very long time. One of the most extensive uses to which Permobond linings have been put is in plating tanks. Many examples of savings as high as 35 per cent in current costs are on record. It saves floors from acid leakage, lowers operating and maintenance costs, and contributes materially to product uniformity. It may be used in tanks for full automatic, semi-automatic and batch plating.

Carboloy's New Standard Blanks

Carboloy Co., Inc., manufacturers of cemented carbide tools, dies, and wheel dressers, announce the development of three styles of standard Carboloy blanks available at reduced prices. The three styles in 96 sizes have been designed for wide application, based upon experience with thousands of carbide tool applications. They are adaptable for use on more than 90 per cent of all carbide tools in use today. In many cases, simple revisions in tool design will enable users to use these standard blanks at a substantial saving in carbide cost. These savings will apply to standard blanks used by manufacturers in making their own tools, or used in Carboloy "Milled and Brazed," or "Finished" tools.

PRACTICAL APPLICATION



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Anticipating Device for Pyrometer Controllers

The Bristol Co., Waterbury, Conn., has perfected a device known as the "B-Linator" for use with automatic pyrometer controllers such as are used on industrial heating furnaces. The purpose of this device is to enable the pyrometer controller to anticipate temperature changes and correct the fuel consumption long enough in advance to prevent the temperature from cycling or rising above and falling below the control point as it does because of the thermal inertia offered by the mass of the furnace and the load.

The B-Linator can be used with practically all of the commonly used types of pyrometer controllers and can be added to present installations as well as incorporated in the control circuit of new equipment. It has the ability to anticipate temperature change trends, and thus enables the control equipment to smooth out the usual wavy control record to a straight line.

The B-Linator through a switching device adds or subtracts an emf. to the regular thermocouple circuit to cause the controller to act in anticipation of a temperature change. The auxiliary emf. is derived from thermocouples in the B-Linator case connected in series but opposing each other. The magnitude of the emf. produced by these thermocouples is dependent on the temperature change trends. The varying emf. produced by the B-Linator annexes the anticipating feature of the control apparatus, enabling it to maintain a close temperature in the furnace.

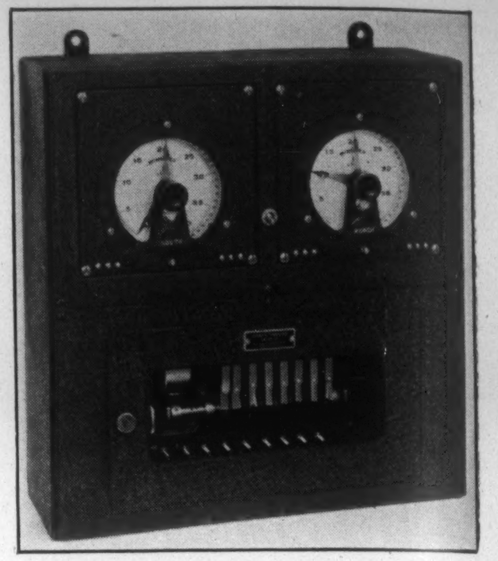
New 150 Amp. A. C. Transformer ARC Welder

A "150-ampere A.C. Transformer Type Arc Welder" has been added to the extensive line of machines manufactured by the Wilson Welder & Metals Co., Inc., of 60 East 42nd St., New York City. With the addition of the new model, there are now available A.C. arc welders in capacities of 150, 300, 500, 750 and 1000 amps.

Recently redesigned, the entire line has an excellent appearance, and in internal arrangement and selection of materials, each is constructed especially for rough, hard shop usage. One of several distinctive features incorporated in the machines includes a system of three controls or adjustments of the welding current. Through the medium of the first two controls it is possible to obtain 25 coarse adjustments. The third control offers a further and finer adjustment of current values within any one of the foregoing twenty-five. By means of these three controls an infinite number of settings may be secured.

A Timer for Automatically Controlling Firing Furnaces

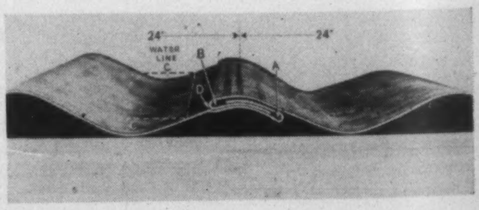
Controlled reversal of firing in soaking pits, open-hearth furnaces, glass melting furnaces, etc., as well as timed reversal of other heating operations is claimed for the "Type 2700 Timer" of the Automatic Temperature Control Co., Philadelphia. Time of firing at each end is said to be regulated automatically according to a pre-set cycle. The operator has at all times direct reading of the progress of the firing cycle, and the apparatus is easily and instantly adjustable to a variety of firing cycles.



This new timer is a combination of two dial timers and one cam timer, which have been units of ATC's standard line for many years. These unit parts have been subject to continued improvement in design until they represent the high point in dependability and low cost maintenance. Type 2700 is an ingenious combination of their standard units adapted to the problem of furnace reversal.

"Kor-Lok" Leak-Proof Corrugated Sheets

Since the advent of corrugated sheet metal for roofing and siding, many attempts have been made to make this kind of covering leak proof. Numerous changes have been tried—each an improvement over the old. Many types of specially crimped sheets made their appearance. Arguments and features have been used mentioning "capillary attraction, siphonage, internal gutters, seepage, drain channels," etc., but the most important reason for leakage has been overlooked. It is nail holes in the sheets. Another, of course, is capillary attraction. The Kor-Lok Co., Cleveland, headed by Harry R. Ansel, has introduced an absolutely leak-proof corrugated sheet steel covering. It has accomplished this by eliminating nail holes and capillary attraction.



The Kor-Lok principle makes it possible to fasten sheets without punching nail holes. The sides of the sheets are so crimped to allow a clip to nest over the side of the bottom sheet and be nailed to the wood deck, holding the sheet firmly in position. Two roofing nails are driven into the clip and not into the corrugated sheet. When the clip is in position on the bottom sheet, the top sheet fits snugly over it. The Kor-Lok lock joint is designed to restrict capillary attraction.

Ordinary corrugated sheets are converted into Kor-Lok by a special rolling machine designed and built by a leading manufacturer of this type of equipment especially for the Kor-Lok Co. Kor-Lok sheets nest for shipment the same as ordinary sheets and the cost of conversion is practically negligible. It is the plan of the company to license exclusive distributors throughout the United States.

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Molded Plastic Mountings For Zinc Microsections

With the rapidly spreading adoption of adequate specifications for plated coatings has come a need for rapid, accurate methods of measuring thickness, both for production control and for acceptance testing. A method which has received considerable application for this purpose is that involving measurement of the thickness at high magnification on a suitable microscope.

In carrying out this method a section is cut from the sample at such a position as to include the portion of the plated surface to which the specification is to apply. This section is polished in a suitable manner in order to reveal clearly the boundaries of the deposits. Simple polishing of an unmounted specimen frequently results in sufficient rounding of the edges to make accurate measurement difficult, if not impossible. It is usually necessary to mount the piece in some way to prevent this.

Many specimens of simple shape may be polished in ordinary screw clamps. Most shapes, however, require mounting in some material which polishes at about the same rate as the sample.

In the past the zinc-cadmium eutectic melting at 264.5 deg. C. (508 deg. F.) has been suggested for this purpose. While this material has desirable polishing and etching characteristics, it offers certain health hazards from fumes arising when it is overheated and occasionally the contact between the specimen and the mount is not all that could be desired. It also tends to smear over the edges of the sample during the polishing operation. A more serious objection, however, lies in the fact that cadmium is a very undesirable element to have present in zinc alloy die castings. So long as cadmium-zinc eutectic mounts are in the plant there is always a definite danger of their accidental inclusion with a lot of die casting metal intended for remelting. The cadmium present in one fair size mount will raise the cadmium content of two tons of zinc die casting alloy to above the maximum limit permitted in the A. S. T. M. specifications.

The specifications for a more suitable mounting material may be defined quite simply. The material must be relatively inexpensive and it must not require excessively expensive equipment for handling it. It must be capable of being formed into a mount in a reasonably short time and at a temperature which does not effect substantial changes in the specimen. It must form a good contact with the work and must have the proper hardness to avoid rounding of the edges of the specimen. The mounting material must not tend to flow or smear over the edge of the specimen and it must be inert to commonly used etching reagents. Above all, it must be incapable of contaminating zinc or other die casting alloys.

The restriction on contamination eliminates all of the common soft, low melting point alloys, such as solder, etc. The zinc-aluminum eutectic and the zinc-aluminum-magnesium ternary eutectic contain no elements which would seriously influence the properties of zinc die castings. Their melting points, however, are so high that even though the specimens were quenched immediately after mounting, a serious amount of diffusion of copper electrodeposits into zinc would take place, and in the case of rolled zinc a certain amount of alteration of the structure would occur as the result of annealing.

Of the many materials investigated, those found to best fit the above requirements are certain plastics capable of being molded at moderate temperatures and pressures. Of those tried here, clear Bakelite XR-3160 and Lucite seem to be the most adaptable. Both produce satisfactory microsection mounts at reasonable cost and neither is a source of contamination of die casting alloys. It is probable that others available now or in the future will prove equally acceptable.

The plastic mount has a number of advantages over the cadmium-zinc eutectic mount. As stated, there can be no contamination of zinc resulting from its use. The plastics are hard and polish well; they do not smear over the edge of the plated coating; and they do produce good contact with the specimen. They are immune to the etching reagents commonly used with zinc. Both of the types found applicable are transparent, thus enabling the worker to see identification numbers on the specimens and to be sure that the specimen surface is mounted at right angles to the plane of polish. The study of defects is facilitated by the ease with which polishing through a given area is accomplished with a transparent mount. Careful tests have shown that the temperatures required for mounting in plastics do not cause diffusion of copper electrodeposits into zinc.

Photoelectrically Balanced Potentiometer

The C. J. Tagliabue Mfg. Co., Brooklyn, has announced a new recorder called the "Celectray." In this radically new type of recorder, a sensitive mirror galvanometer is the primary controlling element in which an inertialess beam of light takes the place of the customary metal boom or pointer. The beam of light from the galvanometer, in moving on and off a phototube, passes the "controlling edge" of a screen, thus operating relays which in turn control a reversing motor which drives the moving contact of the Wheatstone bridge or potentiometer. The phototube is not a calibrated element, but serves only to detect the direction of the light-beam and bring the galvanometer to zero deflection, according to the well-known null method of balancing an electric circuit. The new instrument, therefore, is not a "photoelectric potentiometer" in the sense that a balance of photoelectric current is implied.

It is evident that the galvanometer is free at all times from mechanical engagement, and this fact, together with its low moment of inertia, permits rapid balancing and control actions. Furthermore, a high current sensitivity is available, permitting the use of high resistance, or of very long thermocouple leads without material loss of accuracy in the balancing. Or, on occasion, a very low scale range does not require the use of a very low resistance and its resultant disadvantages.

It is claimed that the new instrument is noteworthy for its extreme simplicity, accuracy and speed, particularly in the multiple point recorders. The average speed of the multiple point instrument is less than 15 secs. per point and the accuracy is guaranteed to 0.1%.

In the Celectray the problem of stopping a moving lightbeam on the edge of a photoelectric cell with speed and precision has been solved for the first time. This solution has resulted in the elimination of many parts from the previous models and has increased the available speed of recording. Numerous kinds of recorder-controllers, recorders and indicating controllers or resistance thermometers, as well as thermocouples and other electrical devices, are available.

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S.A.E. 1020 STEEL CHAPMANIZED 2 HRS.
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S. A. E. 1020 STEEL CARBURIZED 10 HRS. CARBURIZED
1
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WEAR Numbers indicate loss of weight in .001 grams per sq. in.,—after 30,008 strokes, metal to metal, dry.

Take practically any type of free-machining steel . . . Chapmanize it for 3 hours . . . and you get a diamond-hard, ductile-tough case that holds its own in service with costly nitrided alloys, outwears carburizing 9 to 1.

This case can be applied in any depth from .002″ to .035″ — and it won't chip, flake, corrode, warp, distort. Long pieces can be bent or straightened without fracture or cracking. The process itself is simple . . . the bath retains long-term stability . . . and work is clean, uniform, free from soft spots.

These features have opened new ways to product improvement and lower costs for many concerns where this exclusive, patented process is in daily use. Designers and production men are invited to write for new illustrated book on CHAPMANIZING.

The **CHAPMAN VALVE**
MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS

"Hastelloy B" Resists Acids

A new alloy known as "Hastelloy B" is now being offered for use under extremely severe conditions of corrosion. The new alloy has been developed by two units of Union Carbide & Carbon Corp. working in collaboration—Haynes Stellite Co. and Union Carbide & Carbon Research Laboratories, Inc. Hastelloy B is a further addition to the series of Hastelloy alloys which were originally developed 8 yrs. ago, and, like the others, is being marketed by the Haynes Stellite Co., Kokomo, Ind.

This new alloy has been produced primarily for service in equipment handling hydrochloric acid in all concentrations and at temperatures up to and including the boiling point. It also stands up well in sulphuric and phosphoric acids, acetic and other organic acids, and in non-oxidizing acid chloride solutions. In 20 per cent hydrochloric acid at the boiling point the rate of penetration of the solution is only 0.0016 in. per month.

The new alloy is composed of nickel, molybdenum and iron. In this respect it is similar to Hastelloy A, except that the proportion of iron has been decreased and the molybdenum content increased. The increase in molybdenum content results in a higher ultimate tensile strength and higher yield point, with practically no loss in ductility or in reduction of area. The physical properties of Hastelloy B are comparable to those of a good grade of alloy steel—the tensile strength in the forged, rolled and fully annealed state being about 135,000 to 140,000 lb. per sq. in. with an elongation of 44 per cent in 2 in. The hardness and strength of Hastelloy B, although making it somewhat difficult to forge, are of good advantage in other ways, for the alloy is unusually strong at high temperatures, as well as at room temperature.

Since Hastelloy B can be forged and rolled it is available in a number of different forms. Among these, the most important are castings, wrought parts, rolled plate and sheet, wire and welded tubing. Some of the more important applications for Hastelloy B are agitator units, heating and cooling coils, pump and pump parts, condensers, pickling tanks, valves, pipe and fittings. It is expected that because of its excellent physical and mechanical properties, together with its high resistance to hydrochloric and other mineral acids, Hastelloy B will find widespread use for equipment in the chemical and process industries.

A Bronze Having Unusual Properties

An entirely new utilization of bronze is claimed to be aided in its practicability by a new bronze alloy containing higher physical properties than have ever before been attained. It is a development of the Koppers Co.'s Bartlett Hayward Division in Baltimore. Ultimate economies made possible by a bronze alloy of such high ductility, hardness and strength, opens many more avenues of use where replacement and upkeep are serious factors for consideration.

Metallurgists will recognize in "Koppers D-H-S Bronze," physical values claimed never before found in any other non-ferrous alloy. These properties are shown in the following table:

Ultimate tensile strength not less than 125,000 lbs. per sq. in.

Yield point, not less than 95,000 lbs. per sq. in.

Elastic limit, not less than 65,000 lbs. per sq. in.

Elongation in 2 in., not less than 12 per cent.

Reduction of area, not less than 12 per cent.

Brinell hardness number, 250.

The Fort Peck dam order placed with the Bartlett Hayward division of Koppers Co. totals 1,550,000 lbs. of bronze, of which 350,000 lbs. are of the new Koppers D-H-S alloy and the remainder is manganese bronze. The castings weigh from 1 to 4 tons each.

Evidence of the unusual pressure and rolling load resisting qualities of the new bronze alloy is contained in the report of tests conducted by the army engineers on sections of track cut from three sample castings before the order to proceed with manufacture was released.

The manufacturer was required to couple together, in their operating positions, two hardened steel rollers (250 Grinell) 5-in. diameter and 6 in. long, and place this unit between two of the Koppers D-H-S bronze track sections referred to above, and apply loads during a rolling test. Loads of 60,000 lbs. were superimposed upon each roller and this roller train caused to traverse between the sample bronze track sections. While the unit was moving, additional loads, in increments of 5,000 lbs. on each roller, were added, with the following specifications to be met:

"Until permanent deformation takes place, or up to and including 100,000 lbs. per roller."

The castings were examined after 100,000 lbs. had been applied, and, since no deformation was evident, the test was continued and, with 140,000 lbs. or 70 tons, applied on each operating roller no deformation occurred; at 150,000 lbs. or 75 tons on each operating roller, the test was discontinued. At that point deformity was not measurable with the facilities at hand and was only disclosed by a light ray behind a straight edge. Feeler gages 0.0015 in. thick could not be inserted under the straight edge at the deformation point and the Army engineers reported this deformation as "less than 0.0015 in. under 75 tons pressure per each roller while in operation."

In addition to the unusual properties in compression as stated in the preceding paragraphs, the following additional outstanding properties of Koppers D-H-S Bronze, in cast or forged form, has suggested to many engineers wide use of this alloy. D-H-S Bronze is non-magnetic, it resists erosive action of water; has low coefficient of friction with steel; has excellent corrosion resistance to acids, salt water and the elements; is readily machinable; takes on a high polish; is as strong as nickel steel; its surfaces are resilient and do not deform or crack under excessive loading or impact; is not brittle; is strongest of all bronzes under excessive compressive loading, has maximum density and fine grain structure in its sand cast form, and forging and heat treating add little to the physical properties possible in sand castings.

A 48 in. by 48 in. Wheelabrator Tum-Blast

A new model Wheelabrator Tum-Blast unit has been placed on the market by the American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. This unit is much larger than any equipment of this type offered to the trade, heretofore, and is to be known as the "48″ x 48″ Wheelabrator Tum-Blast." Designed primarily for heavy duty service in cleaning reasonably compact castings and forgings weighing up to 300 lbs. and having an operating load capacity of 20 cu. ft., this model will fill a long-felt need in the cleaning room. Centrifugal force replaces compressed air in whipping a steel abrasive onto the metal pieces being cleaned in the Wheelabrator Tum-Blast; a gentle tumbling and complete exposure of all parts in the blasting zone are accomplished by means of an endless type conveyor apron.

Many new features are incorporated in the design of this new equipment. A counter-balanced, power-driven door, opening and closing at the touch of an electric control button, is installed at a 65 deg. angle to permit loading by either an American skip bucket loader or an overhead crane. An auxiliary hopper and screw conveyor, installed in a pit beneath the machine, reclaim the abrasive which rebounds beyond the return abrasive conveying system and is included as standard equipment in this unit. A new suction type abrasive separator removes dust, broken down abrasive, burned molding sand, forging scale and other foreign particles from the abrasive before it is delivered to the wheel.

An ingenious new safety method is utilized in the 48″ x 48″ Wheelabrator Tum-Blast, absolutely preventing damage to the machine through the carelessness of an operator. Controls are arranged so that the door cannot be opened while the machine is in operation; and the loader cannot be raised to charging position nor the conveyor reversed for discharging the load, while the door is in a closed position.

New Development in Insulating Refractories

The Quigley Co. has developed a comprehensive group of 11 insulating refractories, made from "Insulite"—a new calcined fire clay base material of minute cellular structure. In addition to high insulating qualities, Insuline products (available in block, brick, plastic and castable materials) possess the properties of light weight and extremely low heat storage capacity. These are characteristics widely recognized by engineers as vitally important in effecting utmost operating economies.

In actual performance under a wide range of high temperature applications, the various Insuline products have made remarkable savings for plants in fuel economy, increased production, reduced manufacturing cycle, shorter working hours and more comfortable operating conditions.

Take one product for example—"Insulbrix 2,600" are insulating fire bricks particularly suitable for service temperatures up to 2,600 deg. F.; developed for heat-treating, annealing, and other types of fuel fired and electrically heated furnaces; as well as waste heat boilers, flues; also oil stills, core ovens, baking ovens, etc. This brick has 1-17th heat storage capacity of heavy refractories for same heat flow; 1-in. has insulating value of 5 in. of fire brick.

An interesting article entitled "Savings With Insulating Refractories" by J. G. Coutant, consulting engineer, and bulletins descriptive of Insuline products can be obtained from Quigley Co., 56 W. 45th Street, New York City.

Skilsaw Introduces Two Disc Sanders

Once again Skilsaw, Inc. of Chicago announces two new tools to extend the completeness of its well known line of Skilsaw Portable Electric Tools. The new additions are two models of "Skilsaw 7-in. Disc Sanders."—one for heavy duty and one for constant production service.

In appearance, construction and performance efficiency, Skilsaw Disc Sanders represent everything that is new in fine portable tool manufacture. The smooth, trim streamlined body design, the perfect balance and lighter weight make them much easier to use. Comfortable grip handles assure complete control under heavy sanding loads. An efficient air-filter protects the commutator and motor from abrasive dust and dirt. Straight-line ventilation assures a cool-running tool. Ventilating ports are located to blow the dust away from the operator and to prevent clogging. The motor has ample reserve power to insure a long life and provide faster sanding and grinding. Ball bearings in all positions are fully sealed as a protection against dust and grease leakage. The bevel gearing is sturdy and quiet in operation.

Skilsaw 7-in. Disc Sanders are used for removing weld marks, rust and dirt from tanks. vats, etc.; for finishing tile, concrete, stone and marble surfaces; for sanding metals, smoothing steel and iron castings, beams and columns. The heavy duty Model "G" is 16¾ in. long, weighs only 12½ lbs. and sells for $68. The continuous production Model "L" is 16¼ in. long, weighs only 14 lbs. and sells for $80. Both models have aluminum alloy bodies, die-cast in a smooth, streamlined dsign.

Sketch Pad Set

This consists of a pad of tracing paper with a stiff card back, sealed on two edges; a guide plate; and steel straightedge. The buff colored guide plate is printed in blue showing an isometric design and an 8 x 8 to the inch pattern. Any type of drawing can be made to any scale as illustrated. The guide plate is moisture, dirt and crack proof, and is easily cleaned. Made in pads of 200 sheets 5½ x 8½ in.; 100 sheets 8½ x 11 in.; and 50 sheets 11 x 17 in.

Circular No. 16 shows sketching set; isometric and perspective lined papers; beam compass; adjustable curves and tracing sheets with title block, obtainable from the Wade Instrument Co., 2274 Brooklyn Station, Cleveland.

New Overlay Material

Colmonoy, Inc., Los Nietos, Cal., manufacturers of alloy and overlay metals, announces an entirely new process and material for producing a welded-on, wear-resistant, heat-resistant, corrosion-resistant overlay or hard facing.

The new material consists of a paste contained in collapsible tin tubes. This paste may be squeezed out and spread over the surface to be processed and then sweat into the surface of the parent metal with the flame of the oxy-acteylene torch, the atomic hydrogen torch, the carbon electric arc or furnace heat, to form an overlay that actually becames a part of the metal processed.

In reality, this is a new method of handling "Colmonoy Sweat-on" crystals, which is a metallic boride combination, part of which alloys with the parent metal to form a suitable matrix for holding the diamond hard, indestructible metallic borid crystals. The chief advantage of this sort of overlay, aside from its resistance to wear, corrosion and heat, is that it actually becomes a part of the metal processed, so that it cannot chip off and does not interfere with hot or cold forging, or forming or heat treatment of the parent metal.

Further than that, the overlay may be formed on vertical as well as horizontal planes or it may be applied overhead. It can also be used so that an overlay of equal thickness will follow contours or irregular surfaces.

The collapsible tubes contain sufficient material for processing from 1 to 2½ sq. ft. of surface, depending upon the thickness of the overlay formed, and retails for $2.25 each.

New Lacquers Resist Heat

A new line of clear and pigmented air-drying lacquers, specially designed for finishing electrical equipment and other products normally subjected to elevated temperatures, has been developed by Maas & Waldstein Co., makers of industrial finishes, Newark, N. J.

These new finishes, which are known as "Durheat" lacquers, retain their flexibility, color, and adhesion indefinitely at temperatures up to 300° F. They are finding application for direct and indirect lighting fixtures, lamp enclosures, radiant heaters, electric signs subjected to heat, electric ranges, ovens, and similar equipment.

Durheat lacquers are supplied in clear, black, white, and all colors, and can be applied by either dipping or spraying. They can be applied directly to any metal except polished chromium. When used on the latter metal, the surfaces to be finished are first covered with a baked coat of Chroprime.

A New Cleaner

Chemically perfect metal cleansing, prior to finishing, largely accounts for the marked superiority of metal finishes in every field today, according to the research staff of the E. F. Houghton Co. in a bulletin announcing No. 180 as an addition to its Houghto-Clean 100 Series of metal and maintenance cleaners.

"Metal is porous in various compositions and alloys," says this manufacturer, "and if the cleaning operation is not performed with a properly balanced solution that is very free rinsing, a small amount of cleaner will remain on the surface of the metal. This film will be invisible to the naked eye, and subsequently it will be covered with the finished coating.

"After exposure to changes in temperature and various gaseous compounds in the air, electrolysis will take place, resulting in the premature breaking down of the finish no matter how good the finishing material may be. This seldom occurs nowadays because of the widespread use of free-rinsing cleaners."

Smaller "Hot Spots"

Where a "spot" of heat is required within a limited space, a new small cartridge-type heating unit, recently announced by General Electric, offers many advantages. The new unit, the smallest of the G-E line, is only ⅜ in. in diameter and is manufactured with brass sheath for maximum operating temperature of 750 deg. F. It is especially convenient for built-in applications and can be quickly installed. It is available in ratings of 30, 75, and 90 watts at 115 or 230 volts, a-c or d-c.

MODERN STEEL PLANTS SPEED PRODUCTION *in* SOAKING PITS

They insulate with Armstrong's Brick!

Armstrong's N-16 Insulating Fire Brick are shown being installed in the soaking pits of a large steel plant, by the Salem Engineering Co., Salem, Ohio.

INCREASED production in steel plants throughout the country calls for insulation that will assure maximum operating efficiency of soaking pits, furnaces, and other heated equipment. Supervisors of leading plants have found that Armstrong's Insulating Fire Brick successfully meet these requirements. These efficient brick reduce fuel costs, help assure accurate temperature control, and speed up production.

Armstrong's Insulating Fire Brick offer the advantages of low thermal conductivity, high crushing strength, freedom from shrinkage, uniformity, and refractoriness. Armstrong's Brick are available in five types, covering a complete range of temperatures and uses. Armstrong's qualified high temperature insulation engineers will gladly assist you, without charge or obligation, in the selection of proper materials and their application. For samples and descriptive literature, write Armstrong Cork Products Company, Building Materials Division, 982 Concord Street, Lancaster, Penna.

Armstrong's

HIGH TEMPERATURE INSULATION

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